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Original Communications

STUDIES ON UTERINE HEMORRHAGE

RELATION OF THE HEMORRHAGE TO THE EVENTS OF THE MENSTRUAL CYCLE AND TO THE PATHOLOGIC FINDINGS

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OF PRIMARY importance in any consideration of abnormal uterine hemorrhage is the relationship between the pathologic bleeding and the so-called normal blood loss accompanying menstruation. Although the commonly accepted terms "menorrhagia" and "metrorrhagia" may be sufficient for clinical purposes, they are incomplete, since they fail to describe certain pathologic variations of physiologic processes which occur in many instances and thus give no clue as to etiology or treatment. In the present study a detailed analysis of the clinical histories of a large series of patients with abnormal uterine bleeding has been made in order to establish a correlation between the hemorrhage, the sequence of events accompanying the menstrual cycle, and the pathologic findings in the pelvic organs.

All cases of abnormal uterine bleeding, as suggested by Cullen, may be divided into two main groups, namely, (1) hemorrhages associated with pregnancy, and (2) hemorrhages in nonpregnant conditions. Of 1137 consecutive cases available for this study, it was found that 630 belonged to the first category and fell into six main pathologic groups. There were 502 cases of abortions or postabortum complications, 51 of tubal gestation, 38 of placenta previa, 33 of severe postpartum bleeding, and 6 of hydatidiform mole.

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This report, however, is concerned with hemorrhage in nonpregnant conditions and is based on a study of 507 cases. In all instances a complete menstrual history with detailed information as to the character of the abnormal bleeding was available.* It was also essential to have a reliable pathologic report, and since almost all the patients were subjected to some operation it was possible to examine microscopic sections in nearly every instance. It was felt that in the absence of any recognizable pathologic condition no case should be considered unless a satisfactory specimen of at least the endometrium had been obtained.

An analysis of the details of the uterine bleeding showed that the patients could be grouped into eight definite categories:

1. Patients with a regular twenty-eight- or thirty-day cycle, but with a profuse or prolonged flow (menorrhagia) (99 cases).

2. Menses occurring at irregular times: (a) Too frequent menses, that is, with shortened intervals (59) cases); (b) delayed menses, that is, with intervals longer than twenty-eight days (2 cases); and (c) totally irregular intervals (10 cases).

3. A group with continuous bleeding which sets in following a previously normal cycle, and the onset occurs (a) at the time of menstruation (42 cases); (b) during the stage of proliferation (tenth to eighteenth days of the cycle) (17 cases); and (c) during the stage of secretion (premenstrual phase) (3 cases).

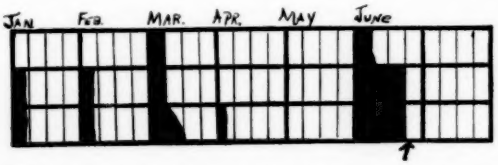

Fig. 1.—Diagram illustrating the use of Schroeder's graph depicting uterine hemorrhage. The width of each column indicates the duration of flow, the space between each vertical line being equivalent to one week; the height of the column shows the amount of bleeding (scanty, moderate, or profuse).

The above example is interpreted as follows:

In January and February the patient had a menstrual period of moderate intensity and lasting five days; in March she had a profuse flow for one week and then scanty for another week; in April she had scanty bleeding for three days. She then had an eight weeks' period of amenorrhea followed by one week of profuse and two weeks of moderate bleeding. She was admitted to the hospital at this time.

4. Patients with a short period of bleeding at about the time of ovulation (tenth to eighteenth days of the cycle) (4 cases).

5. Patients with menorrhagia or irregular menses which become progressively worse each month and the condition eventually ends in atypical and irregular or continuous bleeding (9 cases).

6. Continuous bleeding following a period of amenorrhea of at least six weeks' duration and eliminating all possibility of pregnancy (15 cases).

7. Patients with atypical irregular bleeding having no definite relation to the menstrual cycle (157 cases).

8. Bleeding following the menopause (90 cases).

*The importance of careful history-taking in patients with uterine bleeding cannot be overestimated, not only as a guide to diagnosis and therapy, but also as an aid to scientific investigation. This information should include all details relative to the menstrual periods at different ages as well as data regarding the immediate complaint. The use of a simple graphic method giving the recent menstrual history and occurrence of abnormal uterine bleeding is of great assistance and we have found R. Schroeder's graph very satisfactory for this purpose (Fig. 1). Rubber stamps of this diagram may be made and used in any desired page of the case report.

1. TWENTY-EIGHT DAY CYCLE; MENORRHAGIA

The first group is one of the largest and is made up of patients with profuse or prolonged menstrual periods. The length of the menses varied from seven days to three weeks, and the total duration of the symptoms from two months to fifteen years. The loss of blood was of sufficient severity to produce a secondary anemia in 15 instances, 11 of whom had fibromyomas. Ninety-nine women were in this category, and the pathologic diagnoses showed the following distribution:

Fibromyomas of the uterus	29
Pelvic inflammatory disease	21
No pathology found	12
Uterine displacements	10
Hyperplasia of the endometrium	8
Subinvolution of the uterus	8
Fibromyomas of the uterus plus pelvic inflammatory disease	3
Endometritis	2
Fibromyomas plus polyp of the endometrium	2
Polyp of the endometrium	1
Hypoplasia of the uterus	1
Polyp of the uterine cervix	1
Constitutional factors	1
Total	99

Thirty-two of the patients in this group were over the age of forty (fibromyomas 15, fibromyomas plus pelvic inflammatory disease 1, pelvic inflammatory disease 3, endometritis 1, subinvolution of the uterus 2, hyperplasia of the endometrium 3, endometrial polyps 3, uterine displacements 2, and no pathology found 2). Twenty-six of the patients had had no pregnancies, and of these 10 were found to have fibromyomas of the uterus. The most common type of fibromyoma was the intramural, which occurred in 24 of the cases, while the submucous was found in 6 instances. The histologic study of the endometrium in the 29 cases with fibromyomas of the uterus showed the following: normal endometrium 19, atrophy 4, hyperemia 2, and no specimen available 4.

Although many diseases may lead to menorrhagia, an analysis of these findings shows that the two main factors responsible for profuse periods with a twenty-eight day cycle are conditions which either interfere with the normal contractions of the uterus or which result in a hyperemia of the pelvic organs (fibromyomas of the uterus, pelvic inflammatory disease, subinvolution of the uterus, and uterine displacements). A primary endometrial lesion as the etiologic factor for the bleeding occurred only in a small number of cases. The 8 patients with hyperplasia of the endometrium must be considered as a separate group since there is here an endocrine disorder with ovarian changes in addition to the endometrial disturbance. In 12 instances no gross pathologic lesion could be found to account for the menstrual hemor-

rhages and a diagnostic curettage showed a normal endometrium. The fact that only one (a case of hemophilia) was found in the group "constitutional factors" is due to the system of classification in use in this institution, all such cases having been under the care of another department and thus not appearing in the files of the Gynecological Division. It is well recognized, however, that conditions such as cardiac disease, hypothyroidism, etc., are of considerable importance in any consideration of menorrhagia.

2. IRREGULAR MENSES

In the second category are found women who complained that their menstrual periods occurred at intervals other than the twenty-eight-day type, and they were subdivided so as to define more accurately the type of irregularity noted. (A) The first subgroup included patients whose menses appeared at shortened intervals (every two to three weeks) and 34 of the 59 in addition had a profuse or prolonged flow; (B) patients with prolonged intervals between periods (2 cases); and (C) totally irregular periods, the interval being sometimes shortened and sometimes lengthened (10 cases). The pathologic findings were found to be as follows:

	A	B	C
Pelvic inflammatory disease	14	0	3
Fibromyomas of the uterus	9	0	1
No pathology found	9	1	3
Uterine displacements	8	0	0
Fibromyomas of the uterus plus pelvic inflammatory disease	4	0	0
Hyperplasia of the endometrium	4	0	2
Polyp of the endometrium	3	0	0
Constitutional factors	3	0	0
Adenomyoma of the uterus	2	0	0
Fibromyomas plus polyp of the endometrium	1	0	0
Endometritis	1	0	0
Bilateral teratoma of the ovary	1	0	0
Polyp of the uterine cervix	0	1	0
Hypoplasia of the uterus	0	0	0
Total	59	2	10

In menstrual irregularities of this type it is essential to seek the causal factor in functional disturbances of the ovaries. An analysis of the pathologic findings shows that this is due in many instances to gross anatomic lesions which may also be accompanied by vascular changes. In the first place is found an *active hyperemia* of the ovaries induced by the perioöphoritis incident to pelvic inflammatory disease or accompanying some cases of fibromyomas of the uterus. Second, a *passive hyperemia* may be found with displacements of the uterus due either to an anatomic interference with blood supply or accompanying an asthenic condition of the individual. The association of retroversion of the uterus and frequent menses has been observed by a number of

other authors, and an analysis of 144 cases of uncomplicated retroversion from the Stanford service (MacKinnon) showed that menstrual periods with shortened intervals occurred in 11.8 per cent of the cases, with lengthened intervals in 4.8 per cent, and with totally irregular intervals in 4.2 per cent.

In many instances of irregular menses there is a primary endocrine dysfunction. This may be the explanation for the irregular periods in many of the patients with fibromyomas of the uterus, since 7 of the 10 in this group were women over forty years of age, and it is thus probable that a menopausal endocrine disturbance is the more important feature. From this standpoint one would expect to find more than 8 patients with no gross pelvic pathology, but nevertheless this number represents a higher percentage than in any other group, and it must be remembered that only women who had had a diagnostic curettage were included. Since it is not our practice to resort to the curette merely for menstrual irregularities a large number of cases were necessarily eliminated from the series, and this is also the explanation for the fact that only 2 patients with lengthened intervals were available.

3. REGULAR CYCLE, THEN CONTINUOUS BLEEDING

The third group is of special interest in that it represents a very close connection between menstruation and abnormal bleeding. In the first place, are found 42 cases where bleeding set in with menstruation and continued for from two to four weeks:

Hyperplasia endometrii	11
Pelvic inflammatory disease	6
Carcinoma of the cervix of the uterus	5
Fibromyomas of the uterus	4
No pathology found	3
Adenomyoma of the uterus	2
Endometritis	2
Uterine displacements	2
Polyp of the endometrium plus pelvic inflammatory disease	2
Polyp of the endometrium plus fibromyomas	1
Teratoma of the ovary	1
Polyp cervix of the uterus	1
Fibromyomas plus pelvic inflammatory disease	1
Polyp of the endometrium	1
Total	42

In many of the cases of this group are found lesions intimately connected with the endometrium, and it would thus seem that one of the main factors for this type of bleeding is an interference with the tissue repair following desquamation. This is shown by the occurrence of (a) definite pathologic lesions such as hyperplasia of the endometrium and endometritis, and (b) a mechanical irritation of the endometrium,

demonstrated by 4 cases of endometrial polyps and the fact that in every case of fibromyomas in this group, at least, one tumor was of the submucous variety. It is likely that in other conditions such as cancer of the cervix an important factor is the hyperemia of the uterus accompanying menstruation.

The second subgroup (17 cases) is made up of women with uterine bleeding which sets in between the tenth and eighteenth days of the cycle:

Pelvic inflammatory disease	12
Hyperplasia of the endometrium	2
Fibromyomas of the uterus	1
Fibromyomas of the uteri plus polyp of the endometrium	1
Erosion of the cervix of the uterus	1
Total	17

The figures show very clearly that an overwhelmingly large percentage of patients with this type of bleeding have a pelvic inflammatory disease, and the explanation must be found in an ovarian infection which causes a destruction of the developing corpus luteum and thus an early appearance of "menstruation." In 4 of the cases the ovarian infection could be demonstrated histologically. The experiment of Fraenkel who produced uterine bleeding by cauterization of the corpus luteum, and which has been performed many times since by gynecologists, thus affords the physiologic basis for this type of hemorrhage.

Only three cases were found in which bleeding set in during the premenstrual period, namely, one with an erosion of the cervix, another with a mucous polyp of the cervix, and one with a retroversion of the uterus. It is scarcely conceivable that we are dealing in these cases with any alteration in the course of menstruation, but it is likely that the premenstrual hyperemia of the pelvic organs offers an important contributory factor.

4. OVULATION BLEEDING

The occurrence of uterine bleeding in the middle of the menstrual cycle at the time rupture of the follicle takes place has long been recognized. In this group have been included women who stated that they had a slight sanguineous discharge about one week after the termination of the regular menstrual period and lasting for from two to three days. One of these patients had a subserous myoma which probably had nothing to do with the bleeding; a second showed no gross pathology and the endometrium was normal; another had an endometritis; while the fourth had an extensive pelvic inflammatory disease with involvement of both tubes and ovaries. It is probable that many patients included in Group 2 who complained that their menses occurred

every two weeks also belong to this group of "ovulation bleeding," and evidence for this was advanced in a previous communication.

5. PROGRESSIVE MENORRHAGIA SUCCEEDED BY CONTINUOUS BLEEDING

The fifth group of the series is a small one (9 cases) and is made up mainly of patients with a hyperplasia of the endometrium (5 cases). The clinical history shows very clearly a lesion which gradually progresses over a period of from five months to four years. The patients first notice that their menstrual periods become more profuse or occur at shortened intervals, and this becomes intensified each month until finally the bleeding is continuous. Besides the cases of hyperplasia of the endometrium, this type of history was also obtained from two patients with carcinoma of the cervix uteri, one with a submucous fibromyoma, and one with a fibromyoma plus pelvic inflammatory disease.

6. CONTINUOUS BLEEDING FOLLOWING A PERIOD OF AMENORRHEA

The sixth group presents a series of patients of the childbearing age who complain of uterine bleeding which sets in following a period of amenorrhea unassociated with pregnancy. Fifteen patients were found with this type of hemorrhage, and with the exception of one patient they could be classed into two definite groups. The most important was composed of women with hyperplasia of the endometrium and accounted for 12 of the cases. The period of amenorrhea as a rule varied from six weeks to three months, but in two instances it lasted for as long as seven months and two years respectively.

The second group was of less significance since only two patients were found (fibromyoma of the uterus, carcinoma of the cervix of the uterus). It is characterized by the occurrence of a traumatic or ulcerative lesion in patients who have had amenorrhea due to a previous destruction of the ovaries by radiation or removal by operation.

Only one patient, with a retroversion of the uterus, did not fall into either of the above categories. The diagnostic curettage revealed a normal endometrium with a well-developed stage of secretion, and thus suggests the possibility of amenorrhea due to a corpus luteum persistens.

7. ATYPICAL IRREGULAR BLEEDING

The seventh group is the largest numerically and is made up almost entirely of women of the childbearing age with lesions producing hemorrhage as a result of trauma or ulceration of the cervix or endometrium, so that it has no relation to the events of the menstrual cycle. The pathologic diagnoses of the 157 cases are as follows:

Carcinoma of the cervix of the uterus	61
Fibromyomas of the uterus	17
Hyperplasia of the endometrium	17
Pelvic inflammatory disease	13
Erosion of the cervix uteri	8
Polyp of the endometrium	7
No pathology found	7
Polyp of the cervix of the uterus	6
Carcinoma of the fundus of the uterus	5
Uterine displacements	4
Constitutional factors	3
Subinvolution of the uterus	2
Fibromyomas plus pelvic inflammatory disease	2
Fibromyomas plus polyp of the endometrium	2
Pelvic inflammatory disease plus polyps of the endometrium and cervix of the uterus	1
Hyperemia of the endometrium	1
Carcinoma of the ovary	1
Total	157

8. POSTCLIMACTERIC BLEEDING

Ninety patients who had passed the climacteric complained of irregular uterine bleeding. As in Group 7 one must look for traumatic or ulcerative lesions in the majority of instances, and it is of importance to note the preponderance of malignant disease. A rare condition which must also be kept in mind is the occurrence of hyperplasia of the endometrium accompanying ovarian newgrowths. The conditions found are as follows:

Carcinoma of cervix of uterus	60
Carcinoma of the fundus of the uterus	8
Polyp of the cervix of the uterus	4
Erosion of the cervix of the uterus	3
Prolapse of the uterus (with erosion of the cervix of the uterus)	3
Fibromyomas of the uterus (submucous)	3
No pathology found	3
Polyp of the endometrium	2
Pelvic inflammatory disease	1
Newgrowth ovary (with hyperplasia of the endometrium)	1
Constitutional factors	1
Fibromyomas of the uterus plus pelvic inflammatory disease	1
Total	90

SUMMARY

An analysis of 1137 cases of abnormal uterine bleeding showed that 630 were associated with pregnancy, while 507 cases were in nonpregnant women. The latter patients were classified into 8 distinct categories according to the clinical manifestation of the hemorrhage.

1. Menorrhagia, or profuse or prolonged flow in patients with otherwise normal menses. The sequence of events of the menstrual cycle in the ovaries and endometrium is undisturbed. The most frequent

etiologic factor is any condition which interferes with the contractile power of the uterus or results in a hyperemia of the pelvic organs.

2. There is an irregularity in the time factor, the menstrual periods appearing too frequently, or are delayed, or are totally irregular in their occurrence. The main etiologic factor is to be sought in disturbances of ovarian function, which may be of a primary endocrine nature or secondary due to anatomic lesions.

3. (a) Hemorrhage initiated with a menstrual period may continue for a prolonged length of time. In these cases are mainly found lesions intimately connected with the endometrium, such as submucous fibromyomas and endometrial polyps, or definite pathologic changes such as hyperplasia of the endometrium or endometritis.

(b) Continuous bleeding may set in during the stage of endometrial proliferation. The physiologic explanation may be found in a sudden destruction of the corpus luteum due to extension of an inflammatory process.

(c) Bleeding during the endometrial stage of secretion is of unusual occurrence, and may be partly due to the premenstrual hyperemia of the pelvic organs.

4. Hemorrhage may occur in the middle of the menstrual cycle at a time corresponding to the rupture of the graafian follicle, the so-called "ovulation bleeding."

5. A type of hemorrhage characterizing hyperplasia of the endometrium is found when the menstrual periods become progressively more profuse or irregular and end finally in continuous bleeding.

6. Bleeding may occur following a period of amenorrhea in nonpregnant women of the childbearing age due to (a) hyperplasia of the endometrium, or (b) a traumatic or ulcerative lesion of the uterus following a previous removal or destruction of the ovaries.

7. Hemorrhage may occur at irregular times and without any connection with the events of the menstrual cycle, due to traumatic or ulcerative lesions of the cervix or endometrium resulting from newgrowths or inflammation.

8. Irregular hemorrhage due to the same causes as in Group 7 may occur in women past the climacteric. In rare cases ovarian newgrowths may also affect the endometrium and produce bleeding.

THE TREATMENT OF "IRREGULAR UTERINE HEMORRHAGE" BY THE FEMALE SEX HORMONE*

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THE clinical application of the female sex hormone is still a difficult problem to the scientific gynecologist, despite the advances that have been made by the physiologists. This is particularly true because we are confused by the fact that there are undoubtedly two hormones in the ovary and that these two hormones have an antagonistic action. The problem is still further confused by the fact that what we call the female sex hormone is found not only in the ovary but also in the placenta, amniotic fluid, urine, and blood during pregnancy and in the blood of sexually active women just prior to menstruation. With menstruation it disappears from the circulation, being discharged with the menstrual flow. We are also reasonably certain that the effects of both of these hormones are under the control and markedly altered by the action of other glands of internal secretion, particularly the anterior lobe of the hypophysis. This naturally complicates any ovarian therapy, the question arising as to which gland is primary in the treatment. Add to this the possibility that all experimental data compiled by the physiologists may not apply to human beings as it does to experimental animals and the true scientific application of the female sex hormone in clinical work becomes a phase of gynecology from which any conclusions may be drawn only after the most critical and skeptical analysis.

The physiologists have, in the past few years, reached some striking conclusions which, when correlated, explain our clinical failures.

Brouha[3] found that the typical placentomatous reaction could be obtained in female white rats if the uterine mucosa were irritated surgically after the injection of anterior hypophyseal fluid. These pituitary injections acted directly on the ovaries, inhibiting follicle formation, and resulted in the formation of many corpora lutea. The corpora lutea in turn sensitized the uterine mucosa so that the placentomas followed the irritation. If the irritation preceded the anterior hypophyseal injections so that the corpora lutea were not present at the time of surgical irritation, no placentomas resulted. Nor were these the only prerequisites. The results were also negative if the anterior pituitary was injected for too long a period, during which the stimulating effects of the follicle on the uterine mucosa had disappeared. Placentomas developed only when the decidua was sensitized indirectly by the hypophysis through the corpus luteum while still under the influence

*Read before the Chicago Gynecological Society, April 18, 1930.

of the follicular hormone. This indicates that probably during gestation there are two hormones in the ovary which are under hypophyseal influence, and that both of these are essential in the normal generative processes.

The presence of two hormones in the ovary was further substantiated by Hisaw,[11] who observed that in guinea pigs the pelvic ligaments relaxed and the symphysis separated during pregnancy. This reaction could be reproduced by luteal extracts or by the blood of pregnant animals, provided the guinea pigs were still under the effects of the follicular hormone. No relaxation could be obtained in castrated animals unless they were brought into estrus by the injection of follicular extracts. Moreover, the greatest relaxation and separation of the symphysis resulted when the animal was under the maximum effect of the follicular hormone, which is at the height of estrus. All this would indicate a synergistic action of the two ovarian hormones, despite the fact that numerous physiologists and clinicians have demonstrated the ability of an active corpus luteum hormone to inhibit estrus in rodents, which supports the theory of antagonism between the two ovarian hormones.

The interrelationship of hormones was further demonstrated by Weichert,[16] who, using a corpus luteum extract, obtained the same results as did Brouha with his anterior hypophyseal fluid, namely, a placentomatous reaction. To this may be added the experimental data of Corner and Allen[4] who demonstrated that alcoholic extracts of the corpus luteum, free of phospholipoids, would give the placentomatous reaction when injected into castrated adult female rabbits, whereas extracts of follicular fluid fail to give this reaction. Light is thus cast upon our clinical failures with ovarian therapy. Frank, Goldberger and their coworkers[6, 7] have concluded also that there are two hormones in the ovary, one of which is a water-soluble fraction of the corpus luteum which inhibits growth of the ovarian follicles and sensitizes the uterus for the placentomatous reaction expected in pregnancy, and the other is the estrus-producing hormone. In fact, they conclude "that the corpus luteum, like the anterior lobe of the pituitary, is able to elaborate two distinct and different hormones simultaneously, both of which are necessary for complete function of the genital tract."

Friedman[10] injected the urine of pregnant women intraperitoneally into non-pregnant rabbits and found that the ovaries developed numerous corpora lutea which histologically showed retained ova with lutein transformation of the corpus hemorrhagica. If the rabbits were, however, injected intravenously there resulted within twenty-four hours a typical corpus luteum with extrusion of the ovum, a condition found only in the rabbits postcoitum. Aschheim and Zondek[18] have reported similar results and conclude that the urine of pregnant women is capable of producing the same biologic effect as the anterior lobe of the hypophysis. Fels,[5] in an interesting experiment with parabiotic animals, demonstrated that the hypophysis dominated the condition of the genital tract in both animals anastomosed and that the female sex glands were entirely under its influence.

In addition to all this work by biologists, Wilfred Shaw,[15] in an excellent study of 200 cases of "irregular uterine hemorrhage" decided, from histologic study of the ovaries, that in 152 "there is good reason to believe that the menstrual disorders met in the cases considered result from ovarian disorders and are not, as has been formerly believed, due to abnormalities of the endometrium and myometrium."

We have reached similar conclusions on the basis of years of histologic study of specimens obtained surgically in cases of "irregular uterine hemorrhage." We have become convinced that, as these patients approached the menopause, the direct etiologic factor of these "irregular uterine hemorrhages," or the so-called idiopathic climac-

teric bleedings, was to be found in the ovary. Any other minor pathologic change was of little or no etiologic significance and could be dismissed as a primary cause, being, in fact, merely an associated condition. It seems logical to assume that at menopause there is a hypoovarian function which may be the responsible factor. The difficulty was to demonstrate this deficiency and then to supply the deficiency with the proper ovarian hormone.

Frank and Goldberger[7] demonstrated that the estrus-producing hormone could be readily isolated from the circulating blood of a normal female just before menstruation. This hormone when injected into a spayed female white mouse gave rise to a typical estral cycle. On the basis of this observation, we concluded that it should then be possible to demonstrate hypoovarian function by the absence of this reaction in the mice treated by the premenstrual circulating blood of our patients.

To complete the problem further, the proper ovarian hormone had to be selected to meet this deficiency. The selection necessarily had to be made from a follicular hormone which would be estrus-producing or from the corpus luteum hormone capable of giving the placentomatous reaction. This is a similar demonstration of specific activity to a positive Hisaw test, or in other words, the relaxation of the symphysis. Corpus luteum therapy proved unpractical, as we found no commercial preparation standardized for clinical use which would do this. There were, however, numerous well-standardized estral-producing preparations which we were compelled to use in the attempt to supply the ovarian deficiency. Indirect ovarian stimulation through the use of anterior pituitary hormone was also considered, but after experimentation with available commercial preparations, we concluded that they, too, were unreliable for clinical use.

During the past two years there have been available for study 33 cases of "irregular uterine hemorrhages" in which careful examination revealed minor pelvic diseases and in which the uterine scrapings eliminated all possibility of malignancy. Histologically, our observations were much the same as those reported by Fluhmann.[8] If we compare them with those in his group B of women over forty, we note a striking similarity with one exception. He found 1 case of simple endometrial hypertrophy in 33 cases while we find 6 in 31. This may be due to the fact that in 11 cases he had the complete uterus for study, while we had only curettements. There is no question that a more valuable conclusion can be drawn from a section which includes the musculature than from uterine scrapings. *However, our prime objective was a basis for explaining the bleeding and the varied endometrial picture suggested none.*

HISTOLOGIC OBSERVATIONS IN FLUHMANN'S, IN AUTHOR'S CASES

	Fluhmann (Group B)	*Our Patients*
Glandular hyperplasia of endometrium	23	16
Endometrial polyp	2	2
Simple hypertrophy of endometrium	1	6
Atrophy of endometrium	5	4
Normal endometrium	2	3
Total patients	33	31

Assuming that the uterine hemorrhage is secondary to a deficiency of the female sex hormone, all these patients with "irregular uterine hemorrhage" were next tested prior to menstruation by the Frank and Goldberger technic for the estrus-producing hormone in the circulating blood. This was difficult in our patients as there was no definite cycle to their menses, and despite the fact that the blood of 26 of the 31 patients in this series failed to produce estrus in spayed mice, we felt that no conclusion could be drawn from these negative results. The only other alternative for demonstrating hypoovarian function was to demonstrate the therapeutic effect of injection of an active, potent female sex hormone upon the bleeding of these patients.

The selection of an active hormone which would consistently produce estrus in our spayed mice was water-soluble, and was concentrated enough to be potent in small doses without giving significant local reactions, finally narrowed down to a preparation developed under the specification of Laqueur.[12] Fresh placenta is extracted first with benzene which is then evaporated off. The residue is triturated with alcohol which is also evaporated off and the residue is shaken with water, taking up the female sex hormone and leaving other lipoids.

Technic of Treatment.—If the patient was bleeding much, she was given an initial dose of about 100 mouse units. Whenever possible, fifty mouse units (assayed in our own laboratory on young mice) were injected intramuscularly every other day, beginning, if possible, early in the intermenstruum. The initial course varied from ten to fifteen injections, depending upon the response, and later treatment usually consisted of six injections, beginning about postmenstruum. This was continued until a normal menstrual cycle was established, menopause ensued, or the negative results convinced us of the inadequacy of the treatment.

Results.—Through the hypodermic injection of an aqueous estrus-producing hormone extracted from the placenta, it was possible to control "irregular uterine bleeding" in about 25 out of 31 women. Thirteen of these 25 successfully treated patients were eased into their climacteric and the other 12 have had their "irregular uterine bleeding" changed into what resembles normal menstruation for from two to six months. A hysterectomy in 2 of the 6 failures dis-

closed an undiagnosed submucous fibroid. The other 4 cases were not definitely disposed of.

COMMENT

These results are of special interest in view of the fact that Wintz[17] reports the control of 95 per cent of all uterine hemorrhages due to ovarian dysfunction through the injection of a lipoid substance obtained from the placenta, while we used an aqueous derivative. His preparation, moreover, checked the hemorrhage secondary to fibroids and abortion. Our results would indicate that the aqueous placental extract given to our patient acted only on the functional bleeding.

Novak[13] stated that "since estrus in the lower type is undoubtedly due to the follicle hormone, it seems clear that in the human being the maximum of follicle influence is reached during the interval phase, and that the later changes are due to the corpus luteum influence." We believe that our results tend to substantiate this opinion, for by the use of an aqueous estrus-producing substance free from lipoids we were able to restore our patients to the interval phase and check the so-called irregular uterine hemorrhage.

REPORT OF CASES

CASE 1.—Mrs. A. R., aged forty-four, a secundipara, whose youngest child was fifteen years old, began to have menorrhagia March 18, 1929, with prolongation of the menses until bleeding was continuous. Curettement was done April 2. Scrapings showed atrophic endometrium with some edema. There was no palpable pelvic pathology. The uterus was small and in good position. Serologic laboratory tests were negative. Injections of 50 mouse units were begun May 2 and continued every other day until fifteen injections had been given. The menstrual period May 15 was apparently normal. Six injections were given monthly, ten days previous to the expected date of menstruation. The periods became shorter and the flow diminished each month until November 14, 1929, when the patient had the last period of about one day's duration, followed by complete cessation of uterine hemorrhage. The patient was last seen February 15, 1930 and was in perfect health.

CASE 2.—Mrs. S. A., aged forty, a tertipara, had had her last pregnancy ten years before. Prolonged menstruation began February 18, 1928, and soon the patient menstruated a little almost every day. At times there was a two-day interval with no visible blood. Curettement was done December 27, 1928. There was no apparent pathologic change in the pelvis except for a slight enlargement of the uterus. Both tubes, the appendix, and one ovary had been removed five years previously. Sections showed a richly vascular hyperplastic glandular endometrium.

Injections of 50 mouse units were begun January 21, 1929, and continued every other day for thirty injections. The menstrual period occurred February 2. Six injections were given every month for seven months, ten days previous to the expected date of menstruation. Then three injections were given for four months. The menstrual periods are now regular, of from four to five days' duration with a moderate flow. No injections have been given since December, 1929, but blood has been examined each month for ovarian hormone up to February, 1930.

CASE 3.—Mrs. C. M., aged thirty-eight, a sextipara, had had her last pregnancy four years before. Prolonged menstrual periods began about March 9, 1928, with

the interval between periods shortening until at the time of observation there was about a nine to ten day interval. Examination on May 2, 1929, showed some minor pathologic change in the pelvis. The uterus was of about normal size and retroflexed; the appendages were apparently normal. Dilatation and curettage showed an apparently normal endometrium, slightly vascular with some edema.

On May 15, injections of 50 mouse units were begun and continued for fifteen injections. The first menstrual period occurred June 22 with a moderate flow for four days. Six injections were given monthly ten days prior to the expected period for five months, followed by three injections for two months. Since the last injection the flow has been less than normal in amount but the periods have been of some duration.

CASE 4.—Mrs. O. W., aged thirty-six, a nullipara, had been married eighteen years. There had been irregular prolonged menstruation since January 1, 1929, with an interval between periods of about fifteen days. On examination the patient appeared healthy. The pelvic examination was negative. The uterus was small and in good position; the appendages were apparently normal. The Rubin test showed patent tubes. Dilatation and curettage was done April 16. Scrapings showed endometrium with small glands, very little vascularity, some edema and a rather moderate atrophic endometrium. After leaving the hospital, the patient did not return until June 18, 1929, when she reported that following the curettage she had suffered continuous bleeding.

Injections of 50 mouse units were begun June 18, and continued every other day for twenty-two injections. The abnormal flow stopped July 8 and an apparently normal period occurred August 2. Six injections were given starting August 20, but no menstrual period occurred until September 28. Three injections were given starting October 20, but a period did not occur until November 29. It lasted one day and the flow was slight. The next and last period occurred February 3, 1930.

CASE 5.—Mrs. D. K., aged forty-one, a secundipara, had had her last pregnancy, a four months' miscarriage, at the age of thirty-two. Irregular and prolonged menstruation had been present since March, 1926, with a maximum interval between periods of ten days. Pelvic examination was negative except for mild cervicitis and moderate cervical laceration. Curettage was done April 18, 1929. Sections showed chronic endocervicitis and a somewhat polypoid hypertrophic glandular endometrium.

Injections of 50 mouse units were begun April 27 and continued for sixteen injections. An approximately half normal menstrual period occurred May 28. Six injections were given in June, with a short menstrual period July 7. Three injections were given for the next four months and at present the patient is having regular periods at about thirty-day intervals and lasting from three to four days.

CASE 6.—Miss I. R., had had irregular prolonged menstruation for one and one-half years and at the time of observation blood was present daily. Pelvic examination on August 26, 1929, revealed atrophy of all the pelvic organs, a small uterus in normal position and appendages free from pathologic conditions. Dilatation and curettage showed only a few small fragments of endometrium and sections showed an atrophic, edematous endometrium.

Injections of 50 mouse units were begun September 10, and continued for twelve injections. The patient had a menstrual period of one day with a small flow on October 29. Six injections were given in November. The patient is a graduate nurse employed at Northwestern University in Evanston, and has been using from four to six injections a month at irregular intervals. She has not menstruated since the last period in October, 1929.

CASE 7.—Mrs. E. S., aged forty-two, had been married sixteen years without becoming pregnant. Irregular prolonged menstruation had begun one and one-half years previous to observation. There was no definite interval between periods but it was never longer than five days. Pelvic examination was negative. Dilatation and curettage was done July 2, 1929, revealing a hyperplastic, hemorrhagic, premenstrual endometrium.

Injections of 50 mouse units were begun July 16 and were given every other day for thirty-one injections, during which time there was a slight pinkish discharge every day, and on October 1, an apparently regular menstrual period lasting eight days. At an interval of two weeks from the last period, menstruation occurred again. Injections were given every other day for fifteen injections, followed by rather profuse bleeding, starting November 26 and lasting six days. Injections were begun again December 12 and continued until the next period, December 27. Six injections were given in January with rather profuse bleeding of six days' duration. The periods have since been regular up to the present time.

CASE 8.—Mrs. E. F., aged forty-one, a quadripara, had had her last child eight years previously. Four years before she had had an operation for uterine prolapse, cystocele, and rectocele. An interposition operation had been performed. Pelvic examination, August 10, was negative. For the past three months the menstrual periods had been regular but less in amount than usual and greatly prolonged, with spotting of blood daily for the last month. Dilatation and curettage showed a moderately atrophic edematous endometrium.

Injections of 50 mouse units were begun August 20, and were given every other day for fourteen injections. No bleeding followed the dilatation and curettage and the patient menstruated, October 4, for two days, the flow being slight. Since then she has had regular periods with a much less than normal flow up to the present time.

CASE 9.—Mrs. A. F., aged forty-two, a tertipara, whose last child was thirteen years old, began having prolongation of her menstrual periods six months before examination, with shortening of the interval to about fifteen days. Her January period lasted ten days, from January 6 to January 16. A curettage in October, 1928, showed a hyperplastic endometrium and no evidence of malignancy.

The treatment consisted of hypodermic injection of 50 mouse units of female sex hormone on January 18, 20, 22, 24, and 27, and February 1, 3, 5, and 9. Menstruation began again February 10, after an interval of about three and one-half weeks and was of four days' duration. The treatment was again started February 19 and continued February 21, 23, and 26 and March 2 and 5. Menses occurred again from March 11 to 13. Treatment was given on April 5, 7, and 9, and a very scanty menstrual period occurred from April 11 to 13. The last course of injections was given May 6, 8, 10, 13, and 15. The patient has had no further menstruation, having last been seen in September, 1929.

CASE 10.—Mrs. R. B., aged forty-one, a quadripara whose youngest child was seventeen years old, had been perfectly well until about four months before when her periods gradually became longer and more profuse until they were now of ten days' duration, although the interval had remained about three weeks. The basal metabolic rate was plus 20; the blood pressure was 140/80, the red blood count 3,100,000. Uterine scrapings in November showed a hyperplastic endometrium with marked edema of the stroma. The last menstrual period was from December 19 to January 1, 1929.

The patient was treated by hypodermic injections of an aqueous solution of 50 mouse units, January 7, 9, 11, 14, and 18. The next period was of normal amount and lasted only four days, from January 20 to 24. The same treatment was repeated February 4, 6, 9, 11, and 15, with another normal period occurring

from February 16 to 19. March 4, 7, 9, 11, and 15 she received 50 mouse units again and menstruated March 18 to 20 very scantily. This patient insisted on further treatment, so she was given more injections April 1, 3, 6, 8, and 11, with a scanty period again April 11 to 13. *Then she received no treatment in order to determine the effect of withdrawal of the hormone and she had a profuse period from May 1 to 10.* Treatment was again instituted and she was given 50 mouse units May 25, 27, 29, and 31, and June 1, with the result that she had a scanty period from June 2 to 5 and it seemed advisable to supply her with more hormone on June 19, 22, 24, and 27 and July 1. She had no period in July, so she was not given any treatment. When the patient was last seen, August 22, she was in apparent perfect health and had had no further menstruation.

CASE 11.—Mrs. R. B., a nullipara, aged thirty-nine, had her periods prolonged within the last six months from four or five days to nine or eleven days with only a slight decrease in the interval. She was physically normal and her history was uneventful. A diagnostic curettage three months before had revealed a classic hyperplastic endometrium. The last period was from December 10 to 21 and was very profuse, with the result that when it terminated her red blood count was down to 3,000,000. She received hypodermically 50 mouse units on January 5, 7, 10, 11, and 14 and menstruated four days, from January 15 to 18. She was given further injections February 1, 4, 6, and 9 and menstruated February 11 to 14, the red blood count now being 3,400,000. She was treated on March 1, 4, 5, and 7, and menstruated March 8 to 11, so treatment was again started and she was given injections March 25, 27, and 30 and April 1, with menstruation starting April 3 and stopping April 5. The final course of treatment was given April 22, 24, 26, and 29 and May 1, because the patient ceased to menstruate. When she was seen August 16, she was apparently in perfect health.

CASE 12.—Mrs. A. M., aged thirty-eight, a nullipara, married nineteen years and never pregnant, had had no menstrual complaints until October, 1928, when her periods changed from the five to six day time to ten to twelve days, although the interval remained about four weeks. The physical examination and history were essentially negative. Uterine scrapings taken in November showed a hyperplasia of the endometrium. Her last period prior to this observation had been from December 24 to January 4.

The patient received the usual treatment of 50 mouse units on the following days: January 18, 21, 23, 26, and 28, menstruating three days, from January 30 to February 2, more profusely than normal but much less than in the past five months. The treatment was again given February 18, 20, 22, and 26, with a scanty three-day menstrual period from February 28 to March 2. Another course of injections was given March 31 to April 2. Treatment was continued April 22, 25, and 27, and menstruation followed on April 29 to 30 with a very scanty flow. She received no further treatment and menstruated scantily May 26 to 27, and again June 21 to 22. The patient was last seen August 10 in excellent condition, at which time she reported that she still was menstruating about two days of each month.

CASE 13.—Mrs. J. J., aged thirty-eight, a secundipara whose youngest child was fourteen years old, developed menorrhagia in February with prolongation of periods to from twelve to fifteen days without intermenstrual bleeding. Curettage was done April 2 and scrapings were reported as simple hypertrophy of the endometrium. The last period had been from March 14 to March 25.

Hypodermic injection of 50 mouse units of female sex hormone was started April 8 while the patient was still bleeding postcurettement, and was continued every other day until May 2 when it stopped. Menstruation occurred again May 7 to 9 and was very scanty. Injections were again given May 10, 11, 16, 18, and 20.

Menstruation occurred from June 4 to 7. Treatment was resumed June 18, 21, 24, and 26, and the menses occurred July 1 to 2, being very scanty. No further treatment was given with the expectation that menorrhagia would recur, but the menses again occurred July 29 to 31 and were of normal amount. The patient received no further treatment and was last seen November 22, at which time she reported no further menstrual abnormalities.

CASE 14.—Mrs. M. F., aged forty, a tertipara, had had her last pregnancy eleven years before and had had both menorrhagia and metrorrhagia for the past seven months when first seen April 11. A curettage had been done for diagnosis and as a therapeutic measure January 10, 1929, but the abnormal menses continued. Examination showed an apparently normal premenstrual endometrium and treatment was started while the patient was bleeding profusely, April 11, with 150 mouse units of female sex hormone, as there was no apparent pelvic disease. On April 13, the patient was still bleeding a little, so 150 mouse units were again injected. Uterine bleeding stopped April 14, and 50 mouse units were injected every other day for twenty days. The menses recurred May 4 to 7 and were of rather profuse amount. Treatment was again started May 13, and continued every other day until bleeding reappeared, June 1, 50 mouse units being injected at each time. The June period was very scanty and lasted only three days, stopping on June 4. Treatment with 50 mouse units of the female sex hormone was given again June 15, 17, 19, and 23. The menses occurred again from June 29 to July 1, and again were scanty. Treatment was resumed July 15, 17, 20, and 23 with the menses occurring July 27 to 29. No further treatment was then given. The patient was seen October 2 and reported normal menstruation in August and September. She has failed to return for further observation.

CASE 15.—Mrs. A. L., a tertipara, aged thirty-eight, had had her last pregnancy eleven years before the menorrhagia of at least two weeks' duration for the past five months, the last period continuing from April 22 to May 2. Curettage, April 15, showed edema and hyperplasia of the endometrium. The remainder of this patient's history and physical examination were negative. Treatment consisted of 100 mouse units on May 2, and 50 mouse units on May 6, 8, 11, 13, 15, 18, 21, and 23, respectively. Menstruation occurred from May 20 to June 2 and was of normal amount. Treatment was started again on June 15, and continued June 17, 20, 22, and 24; the next period was scanty in amount from June 28 to July 1. Another course of treatment was given July 13, 15, 18, and 20, with the next period from July 27 to 30. The patient received no further treatment and was last seen in January 1930, when she reported that she still was menstruating once a month for from three to five days.

CASE 16.—Mrs. H. S. (Dr. P. S.), aged thirty-nine, a nullipara, married for ten years during which time she had never been pregnant, had had some unknown pelvic operation seven years before, following which the menses at first were irregular and then, during the past three years, had become gradually prolonged with a shorter interval, until now she was bleeding more than half the time. Periods were at least fifteen days long, with an interval of about the same time. There was no bleeding between the menses, and scrapings taken twice during the past two years had been reported as glandular hyperplasia with some edema of the stroma. The remainder of the history was negative and the pelvis was normal except for the uterus, which was about one and one-half times the normal size. The last period began May 11 and the patient was still bleeding profusely when seen on May 22. Injections of 50 mouse units were started May 22 and continued every other day until ten had been given. She stopped bleeding May 25 and the next period started June 20 after an interval of three weeks and five days, which was the longest interval in three years. Six injections were given monthly, ten days

previous to the expected day of menstruation, and the periods gradually became shorter, until the last period of two days occurred in December. The patient was last seen in March, 1930, and had not menstruated since December. She was apparently in perfect health.

CASE 17.—Mrs. G. R., aged forty-two, a tertipara, had had her last pregnancy fifteen years before and a thyroidectomy three years before, following which menstrual irregularities started, until she noticed there was bleeding twice a month, usually five days during the first week and then after a two-week interval again for about ten to fourteen days. The patient had a mild case of diabetes easily controlled by diet, a normal basal metabolic rate, and a normal pelvis. She was first seen May 30, after she had just finished a period of thirteen days. Uterine scrapings taken in January, 1929, had shown a glandular hyperplasia with "piling up of the glands." Injections of 50 mouse units were begun immediately and continued every other day for fifteen injections. She failed to menstruate in June and her July period lasted from July 2 to 5. Six injections were given every other day about ten days previous to the next expected date of menstruation, and the patient had normal periods in August, September, October, and November. She has failed to menstruate since and was last seen in February, 1930, in excellent health.

CASE 18.—Miss A. L., aged thirty-five, had been treated for splenomegaly in January, 1929, with x-rays and when first seen, June 11, had marked hot flashes, headaches, emotional instability and marked menorrhagia, her periods lasting about fifteen days out of every month. The laboratory reports on the blood were negative and the spleen could not be palpated when she was seen in our clinic. The pelvis was normal and the scrapings showed a normal premenstrual endometrium. Injections of 50 mouse units were started immediately and continued every other day until twelve were given. She bled for four days, from July 4 to 8, and reported that all the subjective symptoms were gone. Six injections were given every month for three months, beginning about fourteen days prior to the expected date of menstruation. Her August period also lasted for four days. In September, she menstruated three days, and missed her period in October. In November, she spotted for three days and then stopped completely. When seen again in February, she reported no further menstruation and apparently had recovered from her menopausal symptoms.

CASE 19.—Mrs. M. G., aged thirty-five, a nullipara, first seen June 25, 1929, reported nervousness, tremor, emotional instability, and loss of weight together with menorrhagia ever since she had been poisoned by gas escaping from her refrigerator early in January, 1929. Her basal metabolic rate was within normal limits and she was essentially normal physically, except for a mild tachycardia. Uterine scrapings obtained in April showed a simple hypertrophy of the endometrium. Her last menstrual period lasted from June 13 to June 24 and was very profuse. She received the usual ten injections of 50 mouse units given every other day beginning June 25. Her next period was of four days' duration, from July 20 to 24. Then she was given six more injections, beginning August 5. Her next period from August 17 to 20 was very scanty. She refused further treatment and was seen again in December, reporting normal menstruation in the intervening months and marked alleviation of her nervous symptoms.

CASE 20.—Miss B. G., aged thirty-nine, gave a history of very scanty menstrual periods until four years before, when she had been treated for six months with some unknown injections and with thyroid by mouth. After this treatment she first had what seemed to her to be normal menstruation, but about eighteen months before, became convinced her periods were much longer than normal with shortening of the interval. The past six months she has menstruated two weeks out of

every month. Uterine scrapings taken in June, 1929, showed a normal premenstrual endometrium, and following this curettement she bled for sixteen days, ending about June 31. She was given fifteen injections of 50 mouse units every other day beginning July 3 and missed July entirely, menstruating next in August from August 8 to 12. During the next two months she received six injections every other day and menstruated normally in September and October, no more menstruation being reported when she was last seen in February, 1930.

CASE 21.—Miss K. F., aged thirty-nine, with an uneventful history, began having irregular menstruation about fifteen months before and for the past four months had had periods that lasted about fourteen days together with occasional spotting in the interval. The pelvis was normal and uterine scrapings taken in April, 1929, showed simple hypertrophy of the endometrium. The patient was first seen July 24, having had her last period from July 9 to 22. Injections of 50 mouse units were begun immediately and continued every other day until fifteen had been given. Her next period was from August 20 to 31. Six injections were given every month for seven months about ten days previous to the expected date of menstruation, and she has had normal periods of about three to five days' duration. The March period was also normal, despite the fact that she received no treatment.

CASE 22.—Mrs. B. K., aged forty, was first seen August 11, when she reported a gradual prolongation of menstruation with some shortening of the interval for the past five months. Uterine scrapings in June showed a glandular hyperplasia and the usual treatment failed to control the hemorrhage. Her last period started August 1 and she was still bleeding profusely August 11, when the treatment was started. She received 50 mouse units every other day until ten injections had been given and spotted for one day in the middle of September, after which she received six more. She failed to menstruate in October and received no treatment. When last seen in February, 1930, the patient reported no further menstruation and appeared in excellent condition.

CASE 23.—Mrs. K. S., a quadripara, aged forty-five, with a negative history, appeared essentially normal on physical examination, except for the left ovary which was about twice the normal size and felt as thought it were cystic. The patient was first seen August 21, 1929, when she complained of menstruation of two weeks' duration with a two weeks' interval. Her next period was from September 1 to 9 and was very profuse, her red blood count dropping to 3,000,000. She was given 50 units of the female sex hormone September 16, 18, 20, 22, 24, 26, and 30, respectively. The next menstruation occurred September 27 to October 1, after an interval of twenty-six days. The treatment was again started October 14, 16, 18, 20, 22, and 24, and she again menstruated from October 26 to 29, very scantily, after an interval of twenty-six days. The cessation of treatment was attempted and on November 23 a very profuse period of seven days' duration commenced. On December 18, 20, 22, and 24 she was given 50 mouse units of female sex hormone and the flow lasted three days, from December 25 to 28.

The patient received no further treatment and had one more period of two days' duration February 22 to 23, but missed her March period. Apparently, it was possible by this therapy to ease the patient into a normal menopause without surgical, x-ray, or radium intervention.

CASE 24.—Dr. S., a nullipara, aged thirty-one, with a normal pelvis, had had a thyroidectomy two years before and since then had had an irregular menstrual history, usually bleeding twice a month for varying periods from eight to ten days. The amount of blood lost was marked and during this time she had had two menstrual hemorrhages lasting the entire month. January 22, after bleeding profusely for seven days, she was given 100 mouse units hypodermically and then 50 units on January 25, 26, 27, and 29 and February 3, 5, and 7. The next

period was very scanty, occurring from February 8 to 11. Treatment was again started February 22, 25, and 28 and March 1, 2, 4, 6, and 8. The next menses were from March 22 to 26, also being very scanty. Curettage in November, 1929, showed hypertrophic endometrium.

CASE 25.—Mrs. L. S., a nullipara, aged thirty-nine, with history and physical examination essentially negative and with no pelvic disease, had a marked anemia with 3,000,000 red blood cells and a hemoglobin of 65 per cent when she bled continuously for twenty-six days. Menstruation was irregular until April, 1929, when she bled continuously for eighty days. This atypical menstrual history continued with periods of from one to thirty-three days and intervals never over fourteen days. Curettage was done July 3, 1929 and no evidence of a malignant condition was found, but a definite hyperplasia of the endometrium was evident. The last period was from December 4 to 11 and was very profuse.

The treatment began December 14 with 100 units of the female sex hormone and 50 units were given December 15, 21, 23, 27, and 30, and January 3, 7, 10, 13, 16, 20, 22, and 25. The next uterine bleeding occurred February 5 to 9, with an interval of six weeks, in a patient in whom, for two years, some bleeding had occurred always before a two weeks' interval had elapsed. Treatment was started again February 15, 17, 20, 22, 25, and 28, and the next menstruation occurred March 3 to 5 and was very scanty. The interval was about four weeks. The effect of no treatment was next observed, and ten days later the patient began to bleed and bled profusely until March 25, when she was given 150 mouse units, which stopped the bleeding on March 26. Another series of five injections of 50 units every other day was started and on March 30 the patient was not bleeding.

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25 EAST WASHINGTON STREET.

A STUDY OF THE HEMOGLOBIN, CELL VOLUME PER CENT AND RED CELL COUNT, INTRAPARTUM AND POSTPARTUM, WITH OBSERVATIONS ON RELATION TO MORBIDITY

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THE occurrence of a severe type of anemia in pregnancy has engaged the attention of clinicians since the time of the earliest reports on anemia.[1] This subject was carefully reviewed by Pepper[2] in 1929, and more recently by Reuben Peterson[3] and his associates who reported additional cases treated by liver and liver extracts. Many reports have appeared emphasizing the frequent occurrence of low hemoglobin values and red cell counts incident to pregnancy.

The object of this investigation was to learn what the usual blood findings are at the termination of pregnancy, the variation subsequent to delivery and possible related factors, and finally whether deviations from the usual have a bearing on the satisfactory termination of pregnancy.

The study itself is concerned with the hemoglobin, cell volume per cent, and red cell count on one hundred women during labor and on the fifth to seventh day postpartum. The women for the study were selected at random, including both house and private patients, and representing all classes of society. Clinical and serologic evidences of syphilis were absent in all cases. No patients were included in whom the later months of pregnancy had been complicated by hemorrhage or febrile conditions. The studies were carried on during November and December, 1929, and March, 1930. In addition to the record of the blood studies, notations were made on the method of delivery, the number of hours in labor, the estimated or measured blood loss in delivery, and significant observations on the condition of the patient and character of the puerperium, if abnormal.

The hemoglobin readings were made by the author, using one of the newer types of Sahli apparatus.† In order to standardize the illumination, the color comparisons were made before a "daylight" lamp with a frosted glass window. The readings will be presented as hemoglobin per cent (Sahli), but in the discussion to follow the *approximate* value, in grams of oxyhemoglobin per 100 c.c. of blood will at times

*The author is indebted to the attending and visiting staff and to Dr. L. E. Daniels, chief of the department, for permission to carry out this study on both private and house patients.

†Hellige Normal Haemometer, manufactured by F. Hellige & Co., Freiburg.

appear also in parenthesis. This translation is given in order to compare the results with the work of others in which different standards have been used.

The red cell counts were, for the most part, made by a technician who assisted in this part of the work, and in a lesser number of cases by a member of the resident staff. In making the red cell counts a standardized Neubauer counting chamber and Thoma pipettes were used. Both hemoglobin determinations and red cell counts were made from blood secured by finger puncture. For absolute accuracy this method is open to criticism, but for purposes of comparison in a clinical study it seemed to be the one of choice. In order to check this point, counts were in some instances made on both the blood from finger puncture and from the vein. In one patient in whom the edema was very marked, the count was 800,000 higher on blood taken directly from the vein. In others the variation was much less marked or negligible. The hemoglobin values were observed to vary in proportion. This point seems worthy of more extensive investigation.

In determining the cell volume per cent, Sahli hemoglobin tubes were used. These were checked for accuracy of bore and calibration. The tubes were filled to the 10 mark with 1.6 per cent sodium oxalate solution. Blood was drawn from the vein in a dry sterile syringe and the tube was filled to the 110 mark. The blood and oxalate solution were gently mixed by rocking the tube. The tubes were then centrifuged and the cell volume read directly in per cent. After a number of trials it was observed that, if sedimentation of the oxalated blood were allowed to take place for thirty minutes and then centrifuged for thirty minutes, further packing of the cells did not occur by prolonging this final period. The addition of the oxalate solution as an anticoagulant, according to Osgood,[4] gives slightly higher reading (3.5 per cent) than when powdered oxalate or citrate is used. This part of the study was carried out entirely by the author. While the determination of the cell volume per cent cannot be considered strictly suitable for routine clinical examinations, it serves as a check against the hemoglobin readings and cell counts. It also serves, with the hemoglobin reading, as an indicator of the qualitative value of the red cells.

REVIEW OF THE LITERATURE

Studies on the blood and pregnancy differ widely in their conclusions. Confusing and contradictory reports can in part be explained by the lack of uniformly accepted standards and by varying methods. Osgood and Haskins[5] in a study of the blood in 100 normal women between the ages of eighteen and thirty concluded that 13.7 grams of oxyhemoglobin per 100 c.c. of blood represented an average. This value approximates 100 per cent by the Dare method and 64.5 per cent by the Sahli. They also found an average cell volume per cent of 41, and an average red cell count of 4.6 million. These figures correspond closely to observa-

tions made by Gram and Norgaard.[6] Haden[7] secured approximately the same averages for hemoglobin and cell count, but by a method similar to the one used in this study, found the average cell volume per cent to be 46.2. These studies were all made on blood drawn from the vein.

Kuehnel,[8] in studying blood taken from the vein in 15 women during pregnancy, used a method similar to that of Osgood and Haskins. He considered 92 per cent hemoglobin (Sahli), 41.5 cell volume per cent, and 4.75 million red cells as normal. His curves show a gradual decline in hemoglobin, cell volume per cent, and erythrocytes during the first sixteen weeks, followed by a period in which the values are stationary, and then a slight rise during the last eight to ten weeks. In the first twelve hours postpartum, the hemoglobin, cell volume per cent, and red cell count fell sharply, but by the sixth or seventh day postpartum they rose above the antepartum level. Both DeLee[9] and Williams[10] state that such a curve represents the usual variation in the hemoglobin and red cell count throughout pregnancy.

Bland and his coworkers,[11] using 13.8 grams of oxyhemoglobin (Dare) as standard (method of securing the blood not stated), reported that 81.5 per cent of pregnant women gave hemoglobin estimates of 74 per cent (10.3 grams) or less, and red cell counts of less than 3.5 million, and 17 per cent were less than 4.0 million. Of 156 patients studied in the last trimester of pregnancy, 55.7 per cent showed less than 3.5 million cells. They further observed that of those with red cell counts less than 3.5 million before labor, 71 per cent gained 200,000 red cells or more in the first seven to ten days postpartum, while only 19 per cent showed a loss of 200,000 red cells or more. Of those having counts of 4 million or over, only 33 per cent showed a gain, while 50 per cent showed a loss. The difference in hemoglobin and red cell counts as found in clinic and private patients was negligible. They also concluded that parity bore no relation to low hemoglobin readings.

In 100 patients studied during pregnancy, Moore[12] found an average hemoglobin reading of 77.7 by Dare (10.6 grams) and an average red cell count of 4,140,675. The average hemoglobin reading was slightly higher in multiparae, while the cell count was slightly lower. Kerwin and Collins,[13] presumably by the same method, found in a study of 86 clinic patients, an average hemoglobin reading of 82 per cent, 15.1 per cent giving readings of 70 per cent or less. The averages were only slightly lower in multiparae than in primiparae.

Galloway[14] found the average for 382 (Sahli) hemoglobin determinations in the third trimester to be 66 per cent (14 grams), and the average for 352 red cell counts in the third trimester to be 3.88 million. On the third day postpartum the average of 179 hemoglobin determinations was 75.53 (16 grams) and red cell counts 4.1 million. On the eleventh day postpartum, the averages for 158 patients were, hemoglobin 82.06 per cent (17.4 grams) and red cell count 4.4 million. These studies were made on private patients.

Lyons[15] in a study of 177 clinic patients approximately at term, found the average Sahli hemoglobin reading to be 75.3 per cent (16 grams). In 22.6 per cent of this number the hemoglobin reading was from 71 to 75 with an average red count of 3,842,000 and in 32.2 per cent the hemoglobin was 70 or less with the red count averaging 3,514,000. He compared these findings with those in a group of women admitted to the surgical service for uncomplicated retroversion and found the occurrence of low hemoglobin values in nearly the same ratio. He concluded that the high incidence of anemia in pregnancy is not dependent on the pregnancy, but to a considerable extent represents a preexisting anemia associated with pregnancy. In the studies of both Lyons and Galloway it is to be observed that while the red cell counts are low the hemoglobin values compare favorably with those found by Osgood and Haskins in normal women.

ANALYSIS OF FINDINGS

For purposes of study, the patients were classified as primiparae and multiparae and further subdivided into private and house patients. A study of Table I shows but slight difference between multiparae and primiparae, and between private and house patients. The hemoglobin does not vary between the groups and from the general average by more than 2 per cent. During the month of February the average hemoglobin reading was 64 per cent for 50 consecutive admissions not included in this study. In a comparison of the general average of intra- and postpartum hemoglobin determinations, a slight tendency to gain is observed. This is true also in all the groups excepting the private primiparae. A further study of the table shows approximately the same relationship between the intrapartum and postpartum cell volume per cent readings and red cell counts. The group of house primiparae was made up of the younger women admitted through the Social Service department late in pregnancy. Among them the incidence of focal infection was especially high, many of them suffering from pyelitis, abscessed teeth, and chronic throat and sinus infections. This may easily account for the lower findings as compared to private primiparae. Assuming that, with the instrument used, 100 per cent represents 21.3 grams oxyhemoglobin per 100 c.c. of blood, the average of 64.5 per cent (13.8 grams) is the same as that found by Osgood and Haskins for normal women. It is nearly the same as the average hemoglobin reading of 64 per cent for 50 consecutive admissions. In comparison to their normal of 4.6 million red cells, the average for this study 3.58 million cells is only 77.8 per cent of the normal number. Using Haden's cell volume per cent average of 46.2, secured by a similar method, the average cell volume per cent of 39.8 represents 86 per cent of the normal. Using the Osgood and Haskins value of 41 increased by 3.5 per cent, the result becomes 39.5/425 or approximately 93 per cent of their average normal. The average for hemoglobin and cell counts bear approximately the same relationship to each other as found by both Galloway and Lyons. The averages themselves are, however, lower and the postpartum increase in hemoglobin and cell count is less marked. The average cell counts are nearly the same as found by Bland and his associates, while the hemoglobin average of 64.5 per cent (13.7 grams) is higher than his average Dare reading.

The occurrence of cell volume per cent averages which are relatively higher than the cell count, might be explained by two, or possibly three, factors. First: The cell volume per cent readings were made on venous blood and not subject to serum dilution, as in the specimens secured for cell count by finger puncture. Considering the postpartum increase in six patients in whom edema was remarkable, the average increase in hemoglobin was 12 per cent, and in cell count 437,000,

TABLE I. AVERAGE HEMOGLOBIN PER CENT, CELL VOLUME PER CENT AND RED CELL COUNT (in millions)

FOR DIFFERENT CLASSES OF PATIENTS

	NUMBER OF PATIENTS	SAHLI HB. IN LABOR	HB. 5 TO 7 DAYS POST-PARTUM	CELL VOLUME PER CENT IN LABOR	5 TO 7 DAYS POST-PARTUM	RED CELL COUNTS IN LABOR	5 TO 7 DAYS POST-PARTUM	HOURS IN LABOR	NUMBER OF OPERATIVE DELIVERIES
Primipara, House	23	63.8	64.5	37.0	37.0	3.56	3.58	17-	14
Multipara, House	25	64.5	67.0	38.5	40.0	3.35	3.45	10-	2
Primipara, Private	32	64.4	63.5	39.6	39.0	3.64	3.70	14	7
Multipara, Private	20	65.0	66.1	39.3	40.7	3.78	3.90	12	3
Average	100	64.5	65.2	38.7	39.3	3.58	3.66	13	26
Primiparae	55	64.4	64.4	38.8	38.4	3.61	3.66	15	
Multiparae	45	64.5	66.5	38.8	40.2	3.54	3.66	11	
House	48	64.2	66.0	38.2	38.8	3.45	3.52	13	
Private	52	64.8	64.5	39.5	39.5	3.62	3.71	13	

while the cell volume per cent increase was only 2.6. (See Table II.) By the fifth to seventh day this edema had, to a great extent, disappeared and specimens suffered less dilution. This is probably not important except in patients with marked edema, but it affects the general average. Second: The increase in the number of white blood cells at the end of pregnancy and in the puerperium would raise the total cell volume per cent slightly above that of nonpregnant women with the same red cell count. The third factor is entirely speculative. In view of the finding of relatively higher hemoglobin averages than cell counts, not only in this series, but also by Galloway and by Lyons, it seems logical to assume that the oxygen carrying capacity of the cell may be increased to compensate for the quantitative decrease in red cells, and with this increase in the amount of hemoglobin in the cell, a slight increase in the size of the individual red cell. This would mean that both the color index and volume index were greater than one. This point apparently hinges on what value is to be taken as a normal hemoglobin. Little support for such a suggestion is to be found in the literature.

TABLE II. COMPARISON OF GAIN IN HEMOGLOBIN, CELL VOLUME PER CENT AND RED CELL COUNT IN THE SIX PATIENTS SHOWING MARKED EDEMA

	HB. PER CENT GAIN	CELL VOLUME PER CENT GAIN	GAIN IN R.B.C. IN THOUSANDS
	12	1	280
	8	1	300
	4	2	572
	15	7	808
	15	1	307
	20	4	356
Aver. Gain	12%	2.6	437

In a study of Table III it is observed that 53 per cent of women in labor gave hemoglobin readings under 65 per cent, while postpartum 47 per cent gave readings under 65 per cent. Table IV shows that 47 per cent gave cell volume per cent readings under 39 before delivery, while postpartum only 39 per cent fell below 39. Table V shows that 46 per cent of the total series gave red cell counts under 3.5 million and only 15 per cent had 4.0 million or above. This incidence of low cell counts coincides with the observations of others, and may be considered as a rather constant finding at or near the end of pregnancy. It is questioned whether women in general show counts of such a low level as suggested by Lyons. A survey of the blood counts on 100 consecutive patients admitted to the surgical and gynecologic services during January, February and March for conditions in which neither fever nor blood loss occurred, showed that the average red count was 4.3 million. Only six counts fell below 4.0 million.

These counts were made by the same technician who made the counts on obstetric patients.

A reference to Table I shows, as noted, a slight tendency toward postpartum gain. In a tabulation of loss and gain (Tables III and VI), 28 per cent gained 5 per cent or more hemoglobin, and 33 per cent gained 200,000 or more cells. This is influenced by two factors. The first has been discussed in reference to edema at the end of pregnancy and its loss by the fifth to seventh day. The second is the concentration of the blood and reduction in the total volume of circulating blood as shown by Keith, Rowntree and Geraghty.[16] They reported

TABLE III. RANGE AND VARIATION IN HEMOGLOBIN READINGS

NUMBER OF PATIENTS		INTRAPARTUM			5 TO 7 DAYS POSTPARTUM			NO SHOWING	
		UNDER 65%	65% TO 69%	70% AND ABOVE	UNDER 65%	65% TO 70%	70% AND ABOVE	5% OR MORE LOSS	GAIN
Primipara, House	23	14	4	5	12	8	3	7	5
Multipara, House	25	12	4	9	8	4	13	6	11
Primipara, Private	32	16	7	9	19	8	5	7	4
Multipara, Private	20	11	4	5	8	3	9	4	8
Total	100	53	19	28	47	23	30	24	28

TABLE IV. DISTRIBUTION OF CELL VOLUME PER CENT UNDER THIRTY-NINE

		INTRAPARTUM	5 TO 7 DAYS POSTPARTUM
Primipara, House	23	14	12
Multipara, House	25	13	6
Primipara, Private	32	11	14
Multipara, Private	20	9	7
Total	100	47	39

that while normally the circulating blood volume constitutes 8.8 per cent of the body weight, just prior to labor it constituted 9.56 per cent of the body weight. Also that while the average blood loss during labor was only 300 c.c., the average blood volume of twelve patients studied seven to ten days after labor showed a loss of 1100 c.c., and equaled only 9 per cent of the body weight.

Referring again to Tables III and VI, it is noted that 24 per cent showed a loss of 5 per cent in hemoglobin and 18 per cent showed a loss of 200,000 or more red cells. Of the 18 patients showing this loss in red count, 13 were noted to have suffered a blood loss above 300 c.c., or to have been subjected to febrile conditions. Furthermore, in no instance in which fever or blood loss was notable was there a definite increase in hemoglobin, cell volume per cent, or cell count. These two factors appear to be of primary importance in accounting for a qualitative and quantitative reduction in red cells.

To determine the effect of long labor, a tabulation was made of those losing or gaining, who were in labor above the average time of thirteen hours (Table VI). This tabulation indicates that, since only 5 lost while 12 definitely gained, prolonged labor in itself cannot be said to lower the postpartum blood findings. This is surprising when it is remembered that the greater number of operative deliveries fall in the group in whom labor exceeded thirteen hours. On the other hand, low findings at the onset of labor do not appear to have a bearing on the length of labor (Table V). It was found that of those in labor above thirteen hours, the proportion in whom the red count was less than 3.5 million was the same as for the entire series, which is in keeping with frequent clinical observation.

TABLE V. INTRAPARTUM CELL COUNTS

(in millions)

	RANGE IN COUNT				RELATION TO LENGTH OF TIME IN LABOR; I.E., OVER 13 HOURS	
	NUMBER OF PATIENTS	UNDER 3.5	3.5 TO 3.9	4.0 AND ABOVE	UNDER 3.5	3.5 OR ABOVE
Primipara, House	23	10	10	3	5	5
Multipara, House	25	17	5	3	6	1
Primipara, Private	32	14	13	5	2	8
Multipara, Private	20	5	11	4	2	3
Total	100	46	39	15	15	17

TABLE VI. NUMBERS LOSING OR GAINING 200,000 OR MORE CELLS IN FIVE TO SEVEN DAYS

	NUMBER OF PATIENTS	NUMBER LOSING	NUMBER LOSING IN WHOM FEVER OCCURRED OR BLOOD LOSS WAS EXCESSIVE	NUMBER GAINING	NUMBER IN LABOR ABOVE AVERAGE TIME; I.E., 13 HOURS	
					LOSING	GAINING
Primipara, House	23	7	5	6	2	2
Multipara, House	25	4	3	9	1	3
Primipara, Private	32	5	4	11	1	4
Multipara, Private	20	2	1	7	1	3
Total	100	18	13	33	5	12

COMMENT

It must be remembered in an appraisal of the findings in any physiologic state that a fixed standard does not exist. When using the term average normal, the modifying conditions must be given. Many deviations from the usual have been observed incident to pregnancy. As hypertrophy of the uterine wall takes place, there is an increase in vascularization[17] so that the capacity of its vessels is doubled. The dimensions of the heart are enlarged[10] the minute volume output is increased by one-third, and the total circulating blood volume is increased out of proportion to the gain in weight. The reduction of the

circulating blood volume out of proportion to blood loss, and the observation that the hemoglobin, cell volume per cent,[16, 18] and cell count, at the same time increased in spite of blood loss, indicates that low intrapartum findings may, in part, be explained by hydremia. Also some of the tendency toward a rapid rise postpartum may be explained by a loss of fluid constituents of the blood. These considerations, together with the observation that low blood findings do not affect adversely the prospects for satisfactory termination of labor, suggest that it is not an abnormal state, but rather in the terms of Paul Kuehnel, "the physiologic anemia of pregnancy."

In the presence of marked edema the vein and skin puncture hemoglobin readings and cell counts tend to vary. With the disappearance of edema, the hemoglobin and cell counts rise more rapidly than does the cell volume per cent. This observation suggests that lowered clinical findings at the end of pregnancy may, at times, be apparent rather than real.

CONCLUSIONS

From a study of the literature and an analysis of observations on 100 women intrapartum and five to seven days postpartum, the following conclusions are drawn.

1. The red cell count and cell volume per cent, during labor, are definitely lower than the usually accepted average, but the lowered findings in the presence of edema may, in part, be apparent rather than real.

2. If the blood loss in labor is not excessive or the puerperium uncomplicated by fever, the blood values tend to rise by the fifth to seventh day postpartum.

3. Neither social status nor parity affects the averages.

4. It cannot be shown that low blood findings have a bearing on the length of labor, nor that long labor influences unfavorably the findings on the fifth to seventh day postpartum.

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INDUCTION OF LABOR BY ARTIFICIAL RUPTURE OF THE MEMBRANES

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ARTIFICIAL rupture of the membranes has long been used as a method to induce labor. However, no critical study of this method has been published. Dr. J. M. Slemons in a personal communication to Dr. J. W. Williams wrote enthusiastically of his experiences in private practice with the rupture of the membranes for the induction of labor, and at Dr. Williams' suggestion, our study was undertaken. This study is particularly timely, since Dr. Morton[1] in December, 1929, published in this Journal an analysis of the experience of the Hopkins Clinic with both the bag and bougie in the induction of labor. It is therefore possible to compare the results obtained by rupture of the membranes with those by means of the bag and bougie in the same clinic material.

The first part of our material was made up of women with normal pregnancies who presented themselves in the dispensary at or near term. They were then sent into the hospital and observed for twenty-four hours to be certain they were not in labor. Rupture of the membranes was done in these first cases to excite pains. When we had sufficiently demonstrated the usefulness of the membrane rupture method to induce labor in normal cases, abnormal cases were added to our material; namely, those in which it was advisable to end the pregnancy because of a toxemia, pyelitis, tuberculosis, or cardiac condition, as well as for postmaturity in normal women. However, we largely restricted the study to the induction of labor in term pregnancies, the method being used only to induce one abortion and four premature labors. The method was studied in 120 cases, 115 being term pregnancies. Of the 120 cases, 70 per cent were white and 30 per cent colored.

We employed three variations of the same method. In series "I" we gave the patients one ounce of castor oil with ten grains of quinine, repeating the dose of quinine after intervals of one and two hours. Two hours later a hot soapsuds enema at 115° F. was given. Four hours after the castor oil had been given, the patient was taken to the delivery room and the membranes ruptured. This was immediately followed by an ampule of pituitrin applied intranasally, according to the method of Hofbauer.[2] The pituitrin was reapplied each

hour until strong pains began. In series "II," we gave the castor oil and quinine exactly as in series "I," and the membranes were ruptured after a similar time interval, but no pituitrin was given. In series "III," we ruptured the membranes without giving preliminary castor oil and quinine, and also without pituitrin.

Technic of Rupturing Membranes.—The patient was shaved and placed in the lithotomy position, the legs being held in stirrups. The perineum was painted with two coats of an acetone-alcohol solution of 2 per cent mercurochrome. One ounce of 4 per cent aqueous mercurochrome was instilled into the vagina. The patient was then examined and the length of the cervical canal and the degree of dilatation of the internal os estimated. The presenting part was palpated and its engagement noted. When the internal os was closed, the index finger was introduced and rotated carefully as a dilator until the tip of the finger could be passed through the internal os. A membrane hook was then passed up along the finger and the membranes were ruptured by allowing the back of the hook to rest parallel to the flexor surface of the finger. Then, by flexing the finger, the hook was made to spear the membranes. In some patients in whom the internal os was already sufficiently dilated to admit one finger, the cervix was further dilated digitally to admit two fingers and the membranes then ruptured. This was done for two reasons: in the first place, we had found from our experience that the membranes could be more easily ruptured if two fingers were introduced and the membrane hook guided between the fingers. In the second place, we thought that this more extensive dilatation of the cervix would hasten the onset of labor and possibly shorten its course. After the membranes were ruptured, the hand was withdrawn and the amount of amniotic fluid expelled was carefully estimated, or, when possible, measured. In many cases, the head was lifted up to allow the escape of more fluid, so that the initial fluid loss could be correlated with the efficiency of the induction. The patient was then returned to the first stage room, where she was kept in bed. Following this, no sterile perineal towel or pad were worn. In none of our cases was there any bleeding following these procedures, which demonstrates that our manipulations did not injure the cervix.

In most patients the rupture of the membranes can be done without the use of a general anesthetic; however, in about one-fifth of the cases an anesthetic was necessary, particularly in primiparae with a closed internal os. Patients in whom "forewaters" were scanty also presented difficulties. In these it was often necessary to push the head up a centimeter or two before rupturing the membranes, for the purpose of avoiding injury to the infant's scalp when spearing the closely applied membranes, although we never met with such an accident. When gas-oxygen anesthesia was used, we were able to rupture the

membranes in every case. In all instances it was done solely with the use of the finger and the membrane hook.

General.—Following the rupture of the membranes, all of our patients went into labor, the longest interval between the rupture of the membranes and the onset of regular labor pains, which we have designated the "latent period," being fifty-two hours. When using either the bag or bougie, it has been customary in order to prevent infection, to remove them after twenty-four hours if labor had not commenced; and accordingly the number of successful inductions with these methods have been figured on the basis of the number of cases in which labor began within twenty-four hours of their introduction. Of the 120 cases we report, only 6, or 5 per cent, had latent periods of twenty-four hours or more. In figuring the percentage of success with the other two methods, Morton considered the case successful even if repeated introductions of the bag or bougie were necessary to finally induce labor; all the separate attempts being summarized as one successful case. Using Morton's criterion of successful cases, the membrane method gave 95 per cent, the bougie 88.2 per cent, and the bag 95.8 per cent in term cases. To be sure, the criterion of a latent period of less than twenty-four hours for a successful induction is not necessary in considering cases induced by rupture of the membranes; as the case with the longest latent period of fifty-two hours was delivered spontaneously of a living child after a total labor of one hour and forty minutes. In addition, the puerperium was afebrile. However, there is a definite relationship between the time elapsing from the rupture of the membranes to the onset of labor, with the development of purperal infection. In the 18 cases with a latent period of more than four hours before the onset of labor following the rupture of the membranes, there was an infection rate of 28.8 per cent; while in the 102 cases with a latent period of four hours or less, it was 6.86 per cent.

Since all of our cases went into labor spontaneously following rupture of the membranes, does this mean that we consider the method 100 per cent successful?

The following 3 cases had very unsatisfactory labors, although it is uncertain whether the method of induction was in any way contributory. In one case, Unit 10,188, a para xii, eleven children living, two miscarriages, there was a latent period of forty-eight hours, and the labor pains were of very poor quality. The patient developed an intrapartum infection which killed the baby. The labor was finally ended after forty-eight hours by manual dilatation of the cervix from 7 cm. and craniotomy upon the dead child. It is worthy of note that in her preceding pregnancy the patient had a similar labor with a similarly torpid uterus. At that time the membranes had ruptured spontaneously before the onset of pains, and castor oil, quinine and pituitrin were given without exciting labor. Finally, after sixty

hours, the last few of which were occupied by indifferent labor pains, the cervix was manually dilated from 7 cm. and a stillborn infant delivered by version. In patient Unit 25,611, a para v, there was a latent period of forty-two hours. This patient also developed an intrapartum infection, and since labor pains were poor, a bag was inserted to hasten delivery. She was delivered by mid-forceps of a good baby, after a labor of twelve and one-half hours. In the third case, Unit 13,280, a para ix, the bag also had to be used to hasten labor. Membranes were ruptured and labor began after an eight and three-fourths hours latent period. Pains were very poor, and the uterus was atonic and flabby. The fetal heart became irregular and rapid. A bag was inserted to hasten labor on behalf of the child, and a living infant was delivered spontaneously after a labor of four hours and thirty-five minutes. In none of these three cases can it be definitely proved that the artificial premature rupture of the membranes in any way influenced the course of labor; however, it is possible. In the other 117 cases, the labors were quite normal. It is important to note that in the 3 unsatisfactory cases we had to deal with women who had borne many children and in whom the uterus was atonic. It is possible that after a more extensive study, such a history may be found to offer a contraindication to this method of induction; but, on the other hand, we had nine cases in women who had borne 5 or more children in whom labor was completely satisfactory.

Comparison of the Three Variations of Method.—The comparative value of the three variations of membrane rupture technic was studied. For this purpose we took 30 consecutive cases for an initial study. To the first 10 we gave castor oil and quinine, ruptured the membranes artificially four hours later, and then gave intranasal pituitrin at hourly intervals until labor pains had become established. To the second group of 10 we gave the preliminary castor oil and quinine, and ruptured the membranes four hours later. In the third group, we ruptured the membranes without using any preliminary or subsequent medication.

In studying these three groups, we compared the latent period in

TABLE I. PRIMIPARAE

METHOD	NO. OF CASES	*Latent Period* TIME IN HOURS FROM RUPTURE OF MEMBRANES TO ONSET OF LABOR	TOTAL LENGTH OF LABOR IN HOURS
Castor Oil-Quinine—Rupture of Membranes—Pituitrin	28	Avg. 1.8 Hr.—Mean 0.93 Hr.	10.01
Castor Oil-Quinine—Rupture of Membranes	25	Avg. 2.5 Hr.—Mean 1.8 Hr.	10.08
Rupture of Membranes Alone	8	Avg. 5.69 Hr.—Mean 5.69 Hr.	11.99

each; that is, the time interval from the rupture of the membranes until the onset of regular pains, and also the duration of labor. These small series demonstrated that the last method was not nearly as efficient as either of the other two. We therefore eliminated that method from the rest of the study, and increased the number of cases with the other two methods. Labor was induced in 54 cases by castor oil, quinine, rupture of the membranes and pituitrin; and in 55 by castor oil, quinine, and rupture of the membranes without pituitrin. In Table I, the latent periods and length of labor of the three methods is given separately for primiparae and multiparae.

TABLE II. MULTIPARAE

METHOD	NO. OF CASES	*Latent Period* TIME IN HOURS FROM RUPTURE OF MEMBRANES TO ONSET OF LABOR	TOTAL LENGTH OF LABOR IN HOURS
Castor Oil-Quinine—Rupture of Membranes—Pituitrin	26	Avg. 3.8 Hr.—Mean 1.49 Hr.	3.29
Castor Oil-Quinine—Rupture of Membranes	30	Avg. 4.2 Hr.—Mean 0.9 Hr.	7.13
Rupture of Membranes Alone	2	Avg. 27.5 Hr.—Mean 27.5 Hr.	8.00

In other words, it appears that the latent period was markedly shortened by preliminary castor oil and quinine, but was apparently little influenced by the use of intranasal pituitrin.

In these cases with premature artificial rupture of the membranes, it is apparent that the length of labor is but little influenced by preliminary castor oil, quinine or pituitrin, except perhaps in multiparae. In the latter, the length of labor was only one-half as long when pituitrin was given.

Length of Labor and Percentage of Spontaneous Deliveries.—It is important to ascertain if the artificial rupture of the membranes used to induce labor influences the length of the labor; and to our surprise Table III shows, in our limited series of cases, that the procedure materially shortened the total length of labor, decreasing it by 73.3 per cent in primiparae, and by 116.4 per cent in multiparae.

TABLE III. LENGTH OF LABOR

AVERAGE LENGTH OF TERM LABOR IN PATIENTS INDUCED BY ARTIFICIAL RUPTURE OF MEMBRANES	AVERAGE LENGTH OF LABOR AT TERM IN 14,396 CASES —HOPKINS HOSPITAL
Primiparae (61 Cases) 10.15 Hours	17.59 Hours
Multiparae (58 Cases) 5.43 Hours	11.75 Hours

This striking decrease in the duration of labor is due to a shortening of both the first and second stages, since the average second stage in the primiparae of our series was 0.97 hour, as compared with the

usual 1.75 to 2.0 hours; while in the multiparae it was only 0.41 hour. The third stage lasted 0.24 and 0.20 hour in the primiparae and multiparae, respectively.

One hundred and three, or 83.5 per cent of the patients were delivered spontaneously. Among the 17 operative deliveries, there were two breech extractions. This incidence of spontaneous delivery compares favorably with that noted in our entire clinical material, in which 81 per cent of 14,396 full-term patients were delivered spontaneously. It is important to determine, if possible, whether the shortening of the length of labor was due primarily to rupturing the membranes artificially before the onset of labor, or to some other factor. There are two factors which might contribute to this result; namely, the birth of small children, or an unusually high incidence of normal pelves.

The average child in our series of primiparae weighed 3226.3 gm. at birth, which approximates closely the expected average figure for infants of whom 36 per cent are colored. The average child of the multiparae weighed 3487.6 gm., of which 22.4 per cent were colored. This conclusively shows that the small size of the children could not explain the marked decrease in the length of labor.

Of the 84 white women in our material, 13 had contracted pelves of moderate degree, an incidence of 15.4 per cent; as compared with 9, or 25.7 per cent in 35 negroes. Upon comparing these figures with those noted in 15,109 consecutive patients in our Clinic, with an incidence of 19.76 and 45.6 per cent in the white and black patients, respectively, it is seen that the gross incidence of contracted pelvis was somewhat below the average; but this may be accounted for in part by the fact that less than 30 per cent of the patients in the present series were black, instead of approximately equal numbers of the two races in the larger series. In addition, many of the patients with contracted pelves in the larger series were delivered by cesarean section, which would lower considerably the percentage of contracted pelves in full-term vaginal deliveries which our material represents. We are therefore safe in assuming that most of the decrease in the length of both the primiparous and multiparous labors in our series of 119 cases was due primarily to the induction by premature artificial rupture of the membranes.

Analysis of Some Other Factors Influencing the Length of Labor, the Latent Period, and the Character of the Labor Pains.—We analyzed the relation of the amount of fluid lost at the time of the rupture of the membranes to the length of the latent period, the duration of labor, and the character of labor pains. Our results showed no uniformity and consequently we are unable to establish any correlation between them.

Likewise, we could establish no relationship between the weight of the child and the latent period; nor did the weight of the child appear

to have any effect upon the length of labor. The expected date of confinement showed no clear-cut relationship to the latent period nor to the length of labor. Those patients in whom labor was induced two weeks before the expected term date seemed just as likely to have a short latent period and short labor as those two weeks past term.

We were interested to learn whether the length of the cervix or its degree of dilatation at the time of induction affected either the latent period or the duration of labor.

TABLE IV

PRIMIPARAE		MULTIPARAE	
DILATATION OF CERVIX IN CM.	LATENT PERIOD IN HR.	DILATATION OF CERVIX IN CM.	LATENT PERIOD IN HR.
Closed	2.44	Closed	6.9
1-2	1.87	1-2	3.26
2+	1.12	2+	0.46

Upon studying our data it was found that in both primiparae and multiparae the degree of dilatation of the cervix directly affected the latent period. In the primiparae with the cervix closed it averaged 2.44 hours, as compared with 1.87 and 1.12 hours when the cervix was dilated 1.0 to 2 cm., or was still more patent, respectively. In multiparae an even more marked correlation was noted, since those with an undilated cervix before the onset of labor had an average latent period of 6.9 hours, those with a cervix 1.0 to 2 cm. 3.26 hours, and those with still greater dilatation only 0.46 hour. This particular factor seems to be of extreme importance in separating those cases with long latent periods from those with short latent periods in both the primiparae and multiparae. Another way of demonstrating this same relationship is to consider separately all patients with latent periods of four hours or more and to compare their cervical dilatation with that noted in patients with a latent period of one hour or less. In 20 patients in the first group the average cervical dilatation was 0.95 cm. at the time the membranes were ruptured; whereas in the second group it was 1.58 cm. To be sure the degree of cervical dilatation does not permit an infallible prognosis as to the length of the latent period, since there were several exceptions to the general rule. On the other hand, it is important to emphasize the fact that the average amount of cervical dilatation at the time of the rupture of the membranes bears no relationship to the duration of labor.

Analysis of the length of the cervix at the time of the induction reveals some interesting positive results, and Table V indicates that in general the latent period becomes longer with increased length of the canal.

Thus, in the last group in Table V, which represents only 17 per cent of the primiparae, we find that the latent period lasted four hours

TABLE V

PRIMIPARAE		MULTIPARAE	
LENGTH OF CERVICAL CANAL IN CM.	LATENT PERIOD IN HR.	LENGTH OF CERVICAL CANAL IN CM.	LATENT PERIOD IN HR.
0.5-1	1.74	0.5-1	4.47
1.5-2	1.53	1.5-2	3.32
2.5-3	1.73	2.5-3	5.25
3.5-4	6.22		

or more in one-half of the patients; and in multiparae there is a similar relationship. The length of the cervix at the time of the induction of labor can also be correlated with the length of the labor. Table VI shows clearly that the longer the cervix at the time the membranes are ruptured, the longer labor will be in both primiparae and multiparae.

TABLE VI

PRIMIPARAE		MULTIPARAE	
DURATION OF LABOR IN HR.	AVERAGE LENGTH OF CERVIX IN CM.	DURATION OF LABOR IN HR.	AVERAGE LENGTH OF CERVIX IN CM.
Less than 8	1.66	Less than 3	1.68
8-16	2.21	3-6	1.65
16+	2.56	16+	2.43

To summarize our findings, it may be stated that there is no constant relationship between either the amount of fluid lost at the time of the rupture of the membranes, the expected date of confinement, or the size of the child, with either the length of the latent period or the duration of labor. The character of the labor pains seemed in no way related to the amount of fluid drained off at the time of induction. The latent period, however, was definitely shorter in both primiparae and multiparae who had a short cervix, and also in whom the cervix was 2 cm. or more dilated at the time of the induction than in others. The length of the labor seemed unaffected by the degree of dilatation of the cervix, but it was influenced by its length. The labors were definitely shorter in the patients in whom the cervical canal was short at the time of the rupture of the membranes.

Morbidity.—Twelve of the 119 patients had febrile puerperia (a rise to 100.4° F. or more on any two days after the first) due to infection; giving a maternal morbidity from this cause of 10.08 per cent. In addition, there were 3 cases in which pyelitis was the indication for induction, and also one case of postpartum mastitis. Including these complications, we have an uncorrected gross maternal morbidity of 13.44 per cent. The only comparable figures at our disposal are those of the Woman's Clinic of the Johns Hopkins Hospital for all term deliveries from 1923 to 1928. (Table VII.)

To be sure, our series is not entirely comparable with our general clinical material. In the first place, 80 per cent of our patients received vaginal instillations of mercurochrome during the course of

TABLE VII

SOURCE OF MATERIAL	BLACKS		WHITES	
	PUERP. INF.	FEB. OTHER CAUSES	PUERP. INF.	FEB. OTHER CAUSES
Hopkins 1923 to 1928	27.0%	4.8%	14.4%	4.5%
119 Cases of Induction by Rupture of Membranes	11.4%	3.6%	9.4%	3.4%

their labor, and as yet, there are no corresponding figures available for our general material; but at least it can be said that this method of inducing labor has not led to any increase in morbidity. In addition, as we said before, our cases represent a selected group, especially as it contained fewer blacks than usual, with their relatively high incidence of contracted pelves. There were 4 cases in the 119 of intrapartum infection (a rise of 100.4° F. or more during the course of the labor), which gives an incidence of 3.36 per cent; but unfortunately there are no figures from our Clinic with which this may be compared.

Maternal and Fetal Mortality.—There were no maternal deaths in our series of induction of labor by premature rupture of the membranes. There were 7 fetal deaths, or a neonatal mortality of 5.88 per cent; one of these was a premature infant, giving a term fetal death rate of 5.08 per cent. This compares satisfactorily to a neonatal mortality of 5.16 per cent in the last 14,316 term deliveries in our service.

Herewith follow the protocols of each fetal death:

(1) Unit 24,630. Primipara. Marked hydramnios. After artificial rupture of the membranes, compound presentation, prolapse of cord. Bag inserted. Child weighed 3,260 gm. Delivered spontaneously; stillborn. Autopsy refused.

(2) Unit 10,133. Multipara. Long latent period. Long labor. Uterine inertia. Intrapartum infection with death of child. Delivered by craniotomy. Autopsy: Extreme maceration. Craniotomy term child.

(3) Unit 16,665. Multipara. Child died twelve hours postpartum. Weight 4,085 gm. Autopsy: Congenital abnormality of pulmonary artery; patent ductus arteriosus; hypertrophy of right ventricle; patent foramen ovale; defect of interventricular septum.

(4) Unit 25,354. Primipara. Child weighed 2,590 gm., and died on the ninth day. Autopsy: Congenital syphilis (?); hemorrhagic disease of newborn; bronchopneumonia left base; patent ductus arteriosus; fresh blood over surface of brain.

(5) Unit 25,957. Primipara. Child weighed 2,820 gm. Spontaneous delivery. Labor twenty-five hours. No clinical cause for death. Autopsy: Patent ductus arteriosus; patent foramen ovale; not known whether lesion was severe enough to be incompatible with life.

(6) Unit 26,173. Primipara with generally contracted typical pelvis. Labor thirty hours, ended by low forceps. Child weighed 3,500 gm. Biparietal 9 cm. Child apparently in good condition when forceps were applied. Difficulty in extraction. Autopsy: Moulding of head; petechial epicardial hemorrhages.

(7) Unit 25,956. Primipara. Premature infant (2,350 gm.). Labor twenty-five and three-quarters hours. Spontaneous delivery. Child died twelve hours postpartum. Autopsy: Premature infant; hemorrhages into epicardium, thymus and falx cerebri.

After studying the above protocols, we can accept responsibility for only two deaths. The patient with hydramnios (Case 1), might have had a similar outcome if she had been allowed to rupture her membranes spontaneously. It is quite possible that with such marked hydramnios a compound presentation would have developed with prolapse of the cord. In Case 2, with atony of the uterus and intrapartum infection, the outcome might have been the same had labor not been induced, since in her previous spontaneous delivery she had similar atony with intrapartum infection and intrauterine death. The other 5 deaths probably would have occurred if labor had been induced or not.

Comparison of the Bag, Bougie, and Rupture of the Membranes.—We reprint Morton's Table VIII for the comparison of the bag and bougie. To this, we have added a third column for the membrane rupture method.

TABLE VIII

	BOUGIE		BAG		RUPTURE OF MEMBRANES	
	CASES	PER CENT	CASES	PER CENT	CASES	PER CENT
General:						
1. Total number of cases	160		49		120	
2. Successful cases	132	82.5	46	93.8	120	100.0
3. Spontaneous deliveries	96	72.7	27	58.8	103	83.5
4. Expectancy of spontaneous delivery within twenty-four hours		59.6		55.1		83.5
5. Breech presentation	3	2.3	7	15.2	2	1.66
Fetal Mortality:						
1. Gross mortality	18	18.1	15	46.9	7	5.88
2. Mortality minus operative mortality	15	15.06	10	31.2	6	5.08
3. Mortality minus operative with toxemia mortality	4	4.0	6	18.7	4	3.36
Maternal Morbidity and Mortality:						
1. Morbidity	34	18.6	17	37.7	16	13.44
2. Mortality, obstetric	2	1.3	1	2.1	0	0
Prolapsed Cord:						
1. Total number incidence	6	4.5	8	17.4	1	0.84
2. Stillborn babies	2		6		1	

A study of Table VIII item by item reveals the unquestioned superiority of the membrane rupture method over the bag or bougie. It seems so conclusive that it leaves little room for doubt. It is important for others to publish similar comparisons to determine whether our series is an especially fortunate one, or whether such results can be obtained generally.

Comparison of Artificial and Spontaneous Premature Rupture of the Membranes.—In order to make our study more complete, we selected 100 consecutive cases entering the hospital in whom the membranes had ruptured spontaneously before the onset of labor. Table IX compares this series of 100 cases with the 119 cases we induced by artificially rupturing the membranes.

TABLE IX

	NO. OF CASES	AVER. LATENT PERIOD—HR.		AVER. LENGTH TOTAL LABOR		AVER. LENGTH SECOND STAGE		TERM NEONATAL MORTALITY PER CENT	INTRA-PARTUM INF. PER CENT	PUER-PERAL INF. PER CENT	SPONT. DELIV-ERIES PER CENT	CONT. PELVES PER CENT
		PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.					
Artificial Rupture	119	2.14	4.01	10.15	5.43	0.97	0.24	5.08	3.36	10.08	83.5	18.48
Spontaneous Rupture	100	8.84	8.25	11.2	7.0	1.01	0.53	5.0	8.0	11.0	78.0	19.0
14,396 Consecutive Deliveries Johns Hopkins Hospital	14,396			17.59	11.75	*1.75+	*1.0	5.16		20.7	81.0	32.68

*Figures taken from Williams' *Obstetrics*, Appleton, 1925.

Upon analyzing Table IX, it is evident that the latent period is much more prolonged in the spontaneous group. In fact, it is four times longer in the primiparae, and more than twice as long in the multiparae than in our series. The probable reasons for this discrepancy are, first, that the uterus in the spontaneous group was not sensitized by preliminary castor oil and quinine; and second, to the absence of intracervical manipulation.

The length of labor in the two groups is practically the same, but if anything somewhat shorter in patients in whom the membranes were ruptured artificially. Upon combining these two groups of 219 patients in which the membranes were ruptured before the onset of labor, it is clear that in them the duration of labor is at least not lengthened. In fact, upon comparing the 119 primiparae in these two groups with the average length of labor noted in the Clinic, we see that the latter was 65.1 per cent longer. In multiparae, the difference is even more marked, since the average length of labor is 93 per cent longer in the other clinic patients. This unexpected difference is in agreement with the experience of Schultze[3] of the University of California. In our experience labor is shortened in both the first and second stages by premature rupture of the membranes. Contributory factors to this decrease in our series may be the relatively low incidence of contracted pelves and the absence of elderly primiparae.

As shown in Table IX, the gross term neonatal mortality appears to be uninfluenced by premature rupture of the membranes.

The incidence of intrapartum infection is much lower in the artificially ruptured group, and is probably explained by their much shorter latent period and somewhat shorter labor. The puerperal infection rate was halved in our 219 cases of ruptured membranes when compared with the total rate in the Clinic from 1923 to 1928. This is unquestionably due to a number of factors. One of importance is that our ruptured membrane group represents a somewhat special group of cases, since no cases neglected or infected on admission were included in it. Likewise, we feel that the shortening of labor is an important factor in lowering the incidence of intrapartum and puerperal infection. It is interesting to note that the vaginal examination and cervical manipulation necessary to rupture the membranes apparently did not increase the incidence of infection.

CONCLUSIONS

1. Labor at or near term can be successfully induced by artificial rupture of the membranes. The efficiency of this method is increased by the preliminary administration of castor oil and quinine.

2. In our experience this method is superior to both the bag and bougie.

3. This technic has decreased the average length of labor, lessened the incidence of puerperal infection, and did not affect the neonatal mortality.

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Laffont, Houel, and Ferrari: Seven Cases of Ligation of the Vena Cava. New Observations on Suppurative Utero-Pelvic Phlebitis. Bull. Soc. d'obst. et de gynéc. **17:** 373, 1928.

The authors are convinced that in the treatment of obstetric pelvic infections, ligation of the vena cava and the utero-ovarian pedicles is the best treatment. If these ligations appear to be insufficient, further operations are performed, such as resection of the utero-ovarian pedicles and hysterectomy either total or subtotal. Vaginal drainage is instituted in these cases. Among the 9 cases thus treated, 3 died.

J. P. Greenhill.

Chydenius, J. J.: The Operative Treatment of Generalized Abortal Peritonitis. Acta obst. et gynec. Scandinav. **10:** 1, 1930.

During the last ten years there were 56 cases of generalized peritonitis following abortion at the Helsingfors gynecologic clinic. Chydenius found that all but one of the 27 patients who were not operated upon died. Of the 29 operated women, 10 recovered. Up to 1926 the operations consisted of laparotomy and simple drainage of the abdominal cavity. Of the 13 women subjected to this type of operation 11 died. After 1926 the operations were much more radical and in most cases the uterus and adnexa were removed by laparotomy and both vaginal and abdominal drainage were instituted. Of the six patients operated upon in this manner 2 recovered. In 10 cases where the pelvic cavity after drainage into the vagina was separated from the abdominal cavity by the sigmoid, there were 6 recoveries.

J. P. Greenhill.

Harris, J. W., and Brown, J. H.: The Bacterial Contents of Vagina and Uterus on the Fifth Day of the Normal Puerperium. Bull. Johns Hopkins Hosp. **43:** 190-200, 1928.

In thirty uteri cultured on the fifth day of the normal, afebrile puerperium only 10 were found sterile, but none contained streptococci.

Vaginal cultures taken at the same time showed the presence of aerobic and anaerobic alpha and gamma streptococci in 24 of the 30 patients; but the aerobic, beta-hemolytic streptococcus, which is the etiologic factor in the majority of fatal cases of puerperal infection, was not present in any of the patients studied.

C. O. Maland.

THE CERVICAL CESAREAN SECTION*

A Report on the End-Results of 418 Consecutive Operations

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THE cervical cesarean section has received increasingly favorable consideration, both in this country and abroad, during the last fifteen years. In a number of American clinics it is gradually replacing the classical type. The names of several obstetricians, who have modified the method in some of its details, have become attached to the operation. The use of these names greatly adds to the confusion which already exists.

Anatomically, the lower uterine segment may be reached by one of three methods in performing cesarean section. (1) The extraperitoneal approach represented by the method of Latzko. (2) The transperitoneal approach illustrated by the procedure of Veit-Fromme-Hirst, where the visceral and parietal layers of peritoneum are united by sutures, thus creating a so-called extraperitoneal space. (3) The intraperitoneal approach where the peritoneal cavity is opened by a longitudinal suprasymphyseal incision, the bladder separated from the lower uterine segment and an incision made in it for delivery. The intraperitoneal operation may be practiced in one of two ways, (1) with a longitudinal cervical incision and (2) with a transverse cervical incision. The cervical incision, in either case, is covered over by the bladder and becomes retrovesical, subperitoneal, or retroperitoneal.

I have personally performed 418 cervical cesarean sections using the four methods according to Table I.

Table I. Type of Operation

Total number of cervical cesarean sections		418
Extraperitoneal	(Latzko)	2
Transperitoneal	(Veit-Fromme-Hirst)	58
Intraperitoneal	(Longitudinal cervical incision, Krönig)	160
	(Transverse cervical incision)	198

I have done the last 198 cervical cesarean sections with a transverse incision which curves upward and which is placed as low down as possible in the lower segment, my own modification of the operation.

*Read at the Forty-Third Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons. Niagara Falls, Canada. September 15, 16, 17, 1930.

The 418 operations were performed in 31 hospitals varying in equipment from that of the large metropolitan hospital where a separate operating room is reserved for cesarean sections to that of the small town hospital where all surgery, clean and septic, including cesarean section is done in the same operating room. The after-care in the out-of-town cases was carried out by the family physician.

In analyzing my series of 418 cervical sections I shall, for the sake of clearness, use the anatomical classification described above.

TABLE II. NUMBER OF PREGNANCIES

	EXTRA-PERITONEAL	TRANS-PERITONEAL	INTRAPERITONEAL	
			LONGITUDINAL INCISION	TRANSVERSE INCISION
Para i	1	41	63	87
Para ii		11	45	52
Para iii			27	28
Para iv		3	13	15
Para v		1	7	7
Para vi		1	1	3
Para vii		1	2	2
Para viii			1	
Para ix			1	2
Para x	1			1
Para xi				1
Total	2	58	160	198

TABLE III. LABOR

	EXTRA-PERITONEAL	TRANS-PERITONEAL	INTRAPERITONEAL	
			LONGITUDINAL INCISION	TRANSVERSE INCISION
Test of labor	2	40	44	68
No labor	0	18	116	130
Total	2	58	160	198

EXTRAPERITONEAL

Two patients had labor, in one the hours were not determined, the cervix was fully dilated. The second was in labor thirty-six hours.

TRANSPERITONEAL

The 40 patients who had labor had the following number of hours: 72, 67, 48, 36—2 patients; 35, 34, 24—7 patients; 20, 18, 17, 16—2 patients, 14—2 patients, 12—2 patients, 6, 5, and 4 hours. In the other 14 patients who had labor the number of hours were not determined.

INTRAPERITONEAL

Longitudinal Incision

The 44 patients who had labor had the following number of hours: 72, 36, 26, 24—5 patients; 17, 16, 12—6 patients; 10, 8, 6—2 patients, and 3 hours. In the other 23 patients who had labor the number of hours were not determined.

Transverse Incision

The 68 patients who had labor had the following number of hours: 72—2 patients; 64, 48—2 patients; 36, 30—2 patients; 24—3 patients; 21, 20—4 patients;

19½, 17, 16—4 patients; 15½, 15—3 patients; 14½, 14—3 patients; 13—2 patients; 12½—2 patients; 12—7 patients; 11—2 patients; 10—2 patients; 9, 8—6 patients; 7½, 7, 6—3 patients; 5—2 patients, and 4 hours. In the other 8 patients who had labor the number of hours were not determined.

TABLE IV. MEMBRANES

	EXTRA-PERITONEAL	TRANS-PERITONEAL	INTRAPERITONEAL	
			LONGI-TUDINAL INCISION	TRANSVERSE INCISION
Membranes ruptured	1	7	11	22
Membranes intact	1	51	149	176
Total	2	58	160	198

EXTRAPERITONEAL

In one woman the membranes had been ruptured many hours; in the other they were intact.

TRANSPERITONEAL

In the cases of the parturient patients where the membranes had ruptured, they had had long labors and the membranes had been ruptured many hours.

INTRAPERITONEAL

Longitudinal Incision

The membranes were ruptured ten hours in one, 6 hours in another, number of hours not determined in nine.

Transverse Incision

The membranes in 22 patients had been ruptured the following number of hours—72, 48—3 patients; 30½, 30, 24, 21, 19, 18, 15, 14, 12, 8, and 3 hours. Hours not determined in 7.

TABLE V. CERVICAL DILATATION

EXTRAPERITONEAL	
Cervix fully dilated	2
TRANSPERITONEAL	
Cervix fully dilated	7
Cervix half dilated	6
Cervix one quarter dilated	9
Cervix slightly dilated	15
Cervix not dilated	21
INTRAPERITONEAL	
Longitudinal Incision	
Cervix fully dilated	3
Cervix dilated to admit 3 fingers	1
Cervix dilated to admit 2 fingers	6
Cervix dilated to admit 1 finger	5

In the other 29 patients who had labor the amount of cervical dilatation was not determined.

Transverse Incision	
Cervix fully dilated	8
Cervix half dilated	2
Cervix one-third dilated	1

In the 57 other gravid women who had labor the dilatation varied from no dilatation to dilatation to admit 4 fingers.

TABLE VI. VAGINAL EXAMINATIONS

EXTRAPERITONEAL	
Several vaginal examinations	2
TRANSPERITONEAL	
Several vaginal examinations	5
Two vaginal examinations	4
One vaginal examination	1

Of the 58 cases 10 had vaginal examinations. All these examinations were done outside, before admission to the hospital.

INTRAPERITONEAL	
Longitudinal Incision	
Several vaginal examinations	4
Two vaginal examinations	1
One vaginal examination	3

One of these vaginal examinations was performed in the hospital, the others before admission to the hospital.

Transverse Incision	
Three vaginal examinations	1
Two vaginal examinations	1
One vaginal examination	4

One parturient patient had a sixty-four hour labor followed by a trial high forceps. Since it was impossible to bring down the head with moderate traction she was delivered by a transverse cervical cesarean section, the placenta and membranes being delivered through the vagina. She had an afebrile puerperium and had no postoperative complications.

All labors in the author's practice are conducted by rectal examinations, hence the small number of vaginal examinations.

Nine puerperae had septic uteri with uteroabdominal fistulas, discharging pus freely through the vagina and through the abdominal incision. All wounds were irrigated with a chlorine solution. All the patients recovered. None developed peritonitis. This group tends to prove that the union of the visceral and parietal peritoneum in the transperitoneal operation offers a definite protection against peritonitis.

CASE I.—Para i. Abruptio placentae, packed twice, once in her home, attempts at manual dilatation before admission.

CASE II.—Para i. Admitted after thirty-five hours of labor with a floating head and ruptured membranes. This case was one of extreme sepsis, the whole cervical incision broke down and one could introduce the sterile fingers through the abdominal opening into the fundus as well as into the cervix. She had an elevation of temperature from 102° F. to 105° F., with a pulse rate of 130 to 150 for twenty days. On the twentieth day her hemoglobin was 30 per cent, and she was given a blood transfusion on this day. She left the hospital on the fifty-second day with a healed incision and in good health. The impressive fact about this case was that while pus was pouring freely from the broken-down cervical incision there was not the least sign of peritoneal irritation, the bowels and bladder functioned normally and she experienced no abdominal symptoms.

CASE III.—Para i. Right occipitoposterior, floating head, long labor, vaginal examinations outside.

CASE IV.—Para i. Right occipitoposterior, floating head, few hours of labor, intact membranes, no vaginal examinations. This might have been considered an ideal case for the classical operation.

CASE V.—Para i. Short test of labor, breech left sacroposterior, neurotic woman, no progress, intact membranes, no vaginal examinations. This case might also have been considered in an ideal condition for the classical operation.

CASE VI.—Para i, elderly, in labor a number of hours before admission, no engagement, intact membranes, eczema of the vulva, no vaginal examinations.

CASE VII.—Para i, admitted with the cervix fully dilated, no engagement, membranes intact, no vaginal examinations.

CASE VIII.—Para i, very stout woman in labor sixty-seven hours, no engagement, cervix fully dilated, membranes ruptured, one vaginal examination in her home before admission, uterus contracted, meconium in utero, vertex presentation, fundal myoma.

CASE IX.—Para i. Rigid cervix, labor 36 hours, membranes ruptured at onset of labor, maternal exhaustion, no engagement.

These nine women with septic, broken-down cervical incisions were prevented from having septic general peritonitis by the protection offered by the united peritoneal layers. They all recovered and were discharged with healed incisions. One of the patients, Case 1, who was operated upon later by the Krönig method, showed a perfectly healed cervix. Another, Case 4, was subsequently delivered in another clinic by a classical section and no weak point was found in the lower segment. Still another patient, Case 9, is pregnant at the present time. Two of the patients fulfilled the indications for the classical cesarean section, that is, just enough labor to dilate their cervices for drainage, intact membranes, never examined vaginally during pregnancy and labor, and yet I am convinced that they would have died of peritonitis had the latter operation been performed. The cases may explain the occasional case of peritonitis following the classic operation, where apparently all indications have been fulfilled. Seven of the cases were considered potentially infected.

Six patients had mild uterine sepsis with a temperature of 101° F., they had no abdominal complications and they all did well.

The following conditions were also responsible for the morbid state, bilateral mammary abscesses: bronchopneumonia occurring in two patients, bilateral thrombophlebitis and acute arthritis of both knee joints (this patient remained in the hospital for two and a half months at which time she was discharged well), superficial infection of the abdominal incision occurring in two patients, an abscess between the cervix and the abdominal wall which drained itself through the inferior angle of the abdominal incision on the eighteenth day, and finally acute dilatation of the stomach occurring on the table and necessitating gastric lavage before returning the patient to her bed.

TABLE VII. INDICATIONS

	EXTRA-PERITONEAL	TRANS-PERITONEAL	INTRAPERITONEAL	
			LONGITUDINAL INCISION	TRANSVERSE INCISION
Cephalopelvic disproportion	2	35	69	74
Cephaloplevic disproportion and myoma		1		1
Spondylolisthetic pelvis		1		
Nägele pelvis			1	1
High breech, generally contracted pelvis		2	4	6
Transverse presentation		1		1
Dystrophia, dystocia syndrome				1
Previous classical cesarean section		4	10	14
Previous cervical cesarean section			36	58
Previous classical and cervical cesarean sections			1	
Eclampsia		3	2	
Toxemia of pregnancy			8	10
Soft part dystocia from previous vaginal plastics and suspensions			3	10
Repair of complete perineal tear and suspension			2	
Amputation of cervix and vaginal plastics			5	
Abdominal fixation of uterus causing dystocia			1	
Previous vesicovaginal fistula (repaired)				1
Congenital malformation of vagina obstructing labor		1		
Elderly primipara, rigid soft parts			1	3
Cervical dystocia		4		
Central placenta previa		2	5	6
Abruptio placentae		4		
Uterine apoplexy, toxemia of pregnancy			5	2
Valvular heart disease, mitral stenosis and regurgitation			6	4
Valvular heart disease, aortic regurgitation and mitral regurgitation			1	
Thyrocardiac				3
Previous multiple myomectomy				1
Multiple myomectomy, fifth month of pregnancy				1
Advanced pulmonary tuberculosis				1
Total	2	58	160	198

TABLE VIII. ANESTHESIA

	EXTRA-PERITONEAL	TRANS-PERITONEAL	INTRAPERITONEAL	
			LONGITUDINAL INCISION	TRANSVERSE INCISION
Local anesthesia			5	9
Spinal anesthesia		1	4	35
Ether anesthesia	2	57	151	154
Total	2	58	160	198

For local anesthesia a 1 per cent solution of novocaine is used.

For spinal anesthesia novocaine crystals dissolved in spinal fluid are employed. The dosage has been 100, 120 and 150 mg. the last dose being rarely used and only in large women.

TABLE IX. POSTOPERATIVE COMPLICATIONS

EXTRAPERITONEAL 2 Cases

One patient had no complications, the temperature, pulse and respirations remained normal.

TRANSPERITONEAL 58 Cases

Septic uteri with uteroabdominal fistulas 9, or 15.5 per cent.

TABLE X

INTRAPERITONEAL	
Longitudinal Incision. 160 Cases	
Thrombophlebitis, right leg	1
Thrombophlebitis, left leg	5
Dilatation of stomach	4
Pulmonary embolism (small embolus and recovery)	2
Sepsis of abdominal incision	3
Pyelitis	2
Lochiometra	2
Acute mastitis (no abscess)	1
Bronchitis	1
Pneumonia	1
Postpartum eclampsia	1
Transverse Incision. 198 Cases	
Thrombophlebitis, left leg	3
Pyelitis	5
Sepsis of abdominal incision	9
Pulmonary infection	3
Dilatation of stomach	2
Low grade uterine sepsis	2
Lochiometra	3
Intestinal paresis	2
Influenza	1
Eclampsia (postpartum)	1
Recurrent pelvic inflammation	1

TABLE XI. MATERNAL MORTALITY

EXTRAPERITONEAL

1 maternal death in 2 cases or 50 per cent.

CASE I.—Para i. Cephalopelvic disproportion, large child (8 pounds 14½ ounces), generally contracted pelvis, labor thirty-six hours, threatened rupture of the uterus, uterus full of meconium in a vertex presentation, fetal asphyxia, maternal exhaustion, thermic elevation, pulse varying between 120 and 130. Latzko operation performed; the peritoneum was not opened and was preserved intact during the entire operation. Transfusion 600 c.c. from her husband the same day. The patient died of general peritonitis the second day after operation.

TRANSPERITONEAL

5 maternal deaths in 58 cases or 8.6 per cent.

Causes of Death

CASE I.—Pulmonary embolism.
CASE II.—Acute gastric dilatation.
CASE III.—Abruptio placentae and uterine apoplexy.
CASE IV.—Myocarditis, pulmonary edema, bronchopneumonia.
CASE V.—Eclampsia, suppression of urine.

CASE I.—Para vii. Spondylolisthetic pelvis, six stillborn children following forceps extractions. Admitted after considerable labor in her home, no vaginal examinations. She died of pulmonary embolism on the fifth day after delivery. There were no abdominal complications.

CASE II.—Para i, forty-one years old, in labor sixteen hours, one vaginal examination in her home. Died of acute gastric dilatation on the fourth day. The patient who was about five feet in height weighed 250 pounds; she had a sharp promontory and no engagement after sixteen hours of labor. She had had acute dilatation of the stomach following an appendectomy a few years previously, and her history showed that she had nearly died of this complication.

CASE III.—Para i. Abruptio placentae and uterine apoplexy at term. Severe uterine hemorrhage, no dilatation, no labor. She died of the results of hemorrhage the day of operation.

CASE IV.—Para i, very obese woman weighing 275 pounds, sharp promontory, labor twenty-four hours, no engagement, right occipitoposterior, vaginal examinations in her home before admission. She died on the sixth day of myocarditis, pulmonary edema and bronchopneumonia.

CASE V.—Para i, forty years old, three weeks overdue, labor sixteen hours, 3 convulsions, all intrapartum, no engagement, 2 vaginal examinations in her home before admission. She was operated upon at 10 A.M. and died at 7 P.M. There was total suppression of urine, none having been obtained after operation.

INTRAPERITONEAL

Longitudinal Incision

9 maternal deaths in 160 cases or 5.6 per cent

Causes of Death

Bronchopneumonia, sepsis	1
Eclampsia	2
Pulmonary embolism	2
Heart disease	3
Acute gastric dilatation, intestinal paralysis	1

CASE I.—Para ii, twenty-eight years old, first pregnancy terminated by the extraction of a stillborn child presenting by the breech. During the present pregnancy she had an attack of appendicitis at seven and one-half months. She was greatly weakened by pernicious vomiting, her pulse rate was 120 from the beginning of pregnancy. Operation on August 23, 1922 after a long test of labor, the scarred cervix showing no sign of dilatation and the pulse rising to 140 with each uterine contraction. During the convalescence she developed an abscess between the lower uterine segment and the bladder; this was drained by an anterior colpotomy on September 3. Bronchopneumonia supervened and the patient died. At the time of her death she had had no abdominal symptoms and the incision had healed by first intention.

CASE II.—Para i, forty-two years old, no prenatal care, eclampsia, frequent convulsions, no labor, no dilatation. The patient was moribund when seen. Operation in the interest of the child. The mother died shortly after the intervention but the child survived.

CASE III.—Para i, thirty-six years old, at term, eclampsia, frequent convulsions, deep coma, marked cyanosis, no labor, 2 vaginal examinations, 30 c.c. of smoky urine obtained by catheter, delivered of a macerated fetus. The kidneys ceased to function after operation and she died fourteen hours after delivery.

CASE IV.—Para iii, thirty years old, two stillborn children, the first following a breech extraction, the second following version and extraction. Toxemia of pregnancy, systolic pressure 170, no labor, no vaginal examinations. Simple convalescence, incision healed by first intention. On the fourteenth postoperative day she died of pulmonary embolism while sitting in bed nursing her child.

CASE V.—Para iii. Generally contracted pelvis, two previous classical cesarean sections, no labor, no vaginal examinations. Valvular heart disease and myocarditis. She died of cardiac disease on the ninth day.

CASE VI.—Para ii, thirty years old, cephalopelvic disproportion (fetus weighed 4773 gm.), few hours of labor, no vaginal examinations. Pulmonary embolism while she was transported from the operating room to her bed, bronchopneumonia and death on the eighth day.

CASE VII.—Para i, twenty-eight years old, mitral stenosis and regurgitation with decompensation, eight months pregnant, cervical cesarean under local infiltration anesthesia, delivered of a macerated fetus. She died of acute cardiac dilatation a few hours after operation.

CASE VIII.—Para i. Central placenta previa, two hemorrhages, operated upon for pelvic peritonitis with drainage two years previously, digestive disturbances since this operation, accentuated during the pregnancy. Cervical cesarean section, transverse colon adherent to the uterine fundus, for an area 15 cm. in length, omental adhesions; the adhesions were liberated at the time of operation and the abdomen closed in the usual manner. Acute dilatation of the stomach on the table; stomach lavage, stomach lavage repeated in thirty-six hours for the same condition. Forty-eight hours after operation marked distention; jejunostomy under local anesthesia in her bed, no sign of peritonitis observed. Blood transfusion 500 c.c. The patient improved after the transfusion but gradually weakened and died a few hours later. No uterine complications.

CASE IX.—Para iii, thirty-four years old, aortic regurgitation and mitral regurgitation, two previous cervical cesarean sections, no labor, no vaginal examinations. Good recovery from the anesthesia. No distention. Died of cardiac disease on the fourth day.

TRANSVERSE INCISION

6 maternal deaths in 198 cases or 3.0 per cent.

Causes of Death

Uterine apoplexy	1
Septicemia	1
Lobar pneumonia	1
Pulmonary embolism, eleventh day	1
Acute cardiac dilatation, fibroid uterus	1
Pulmonary embolism, fourteenth day	1

CASE I.—Para ii. Her first pregnancy had ended in an abortion. She had severe toxemia of pregnancy and had disregarded all the instructions given at the clinic. She was admitted at seven and a half months of pregnancy with complete separation of the placenta and uterine apoplexy. She had no labor, no vaginal examination, the membranes were intact, the cervix was long and rigid, the urine boiled solid and she was in tremendous shock on admission. A stillborn fetus was delivered. She never came out of her shock and died nine and a half hours after operation.

CASE II.—Para iii. Her first child was stillborn, her second pregnancy had ended in an abortion. She had toxemia of pregnancy, the urine boiled solid, she was getting gradually worse under active treatment, she had no convulsions. The gravid patient had had no labor, no vaginal examinations and her membranes were intact. The operation was done in twenty-two minutes and the patient left the table in excellent condition. She died of septicemia four days after operation. There were no clinical signs of peritonitis. A postmortem examination was refused.

CASE III.—Para ii, thirty-six years of age. She had been delivered by high forceps twelve years previously. She had gained seventy pounds in weight the last three months of pregnancy. She had a large child which weighed nine pounds and twelve ounces. The operation was done at term, there had been no labor, no vaginal examinations and the membranes were intact. She died of lobar pneumonia six days after operation.

CASE IV.—Para xi. Cesarean section was done because of extensive vaginal plastics and suspension of the uterus which had been performed after the previous delivery. The operation was done at term. There had been no labor, no vaginal

examinations and the membranes were intact. The patient had an afebrile convalescence, the incision had healed by first intention, and there had been no complications during the puerperium. On the eleventh day she had breakfast at 7:30 A.M. and felt perfectly well. She suddenly died at 9:13 A.M. from a pulmonary embolus.

CASE V.—Para i. The pregnancy extended twenty-three days after the expected date; there was a large calcified myoma at the right uterine horn. She had nine hours of hard labor at which time the cervix was one finger dilated. Signs of fetal distress became apparent and meconium was passed by the vagina, the fetus presenting by the vertex. There was apparent threatened rupture of the uterus. The patient had a mitral lesion. There was a weak area in the left anterior wall of the uterus. The patient went into severe shock as soon as the abdominal incision was made, the baby was quickly delivered and the uterine segment closed. The fundus acted poorly but contracted after the injection of 3 c.c. of pituitrin and 3 c.c. of ergot. The patient was in no condition to stand a hysterectomy although permission had been obtained to remove the uterus. She was given 1000 c.c. of saline solution by hypodermoclysis and was returned to bed in fair condition. She died a few hours later of cardiac dilatation. There had been no bleeding from the uterus.

CASE VI.—Para ii. The first pregnancy had terminated in an abortion at four months, one year previously. The patient showed the dystrophia, dystocia syndrome. She was of short stature, had a small pelvis and a large child. At the end of fourteen and one-half hours of labor the cervix was fully dilated, the membranes were intact and the presenting vertex was overriding the symphysis. The operation was performed under spinal anesthesia. The convalescence was uneventful except for a small stitch abscess which evacuated itself spontaneously. She got out of bed on the twelfth day, was walking on the thirteenth and was going home on the fourteen day. The morning of the fourteen day she got up and stated that she felt faint; she was put back to bed and died in a few minutes of pulmonary embolism. A necropsy was performed; a clot 2 cm. in length was found at the bifurcation of the pulmonary artery and smaller clots extending in both branches. There was a superficial stitch abscess. The abdominal cavity showed no infection; there were no adhesions; the cervical incision was healed and clean; there was no accumulation under the bladder.

MATERNAL MORTALITY

TYPE OF OPERATION		NUMBER	MATERNAL DEATH	PER CENT
Extraperitoneal (Latzko)		2	1	50.0
Transperitoneal (Veit-Fromme-Hirst)		58	5	8.6
Intraperitoneal	Longitudinal incision	160	9	5.6
	Transverse incision	198	6	3.0
Total number operations		418	Deaths 21	Per cent 5.0

MATERNAL DEATHS

By Causes

21 deaths in 418 operations

Pulmonary embolism	5	1.19 per cent
Gastric dilatation	2	0.47 per cent
Uterine apoplexy	2	0.47 per cent
Pneumonia	3	0.71 per cent
Heart disease	4	0.95 per cent
Septicemia	1	0.23 per cent
General peritonitis	1	0.23 per cent

The highest maternal mortality 1.19 per cent was due to pulmonary embolism. For purposes of comparison I analyzed 53 classical cesarean sections which I had performed before resorting to the cervical operations. I had used the Asa B. Davis technic making the abdominal incision entirely above the umbilicus and the uterine incision in the fundus. In other words, in this type of operation the uterine incision is placed as far away from the cervix as it is possible to place it. I had 2 maternal deaths from pulmonary embolism in the 53 cases, a mortality of 3.7 per cent, three times higher than that following the cervical operation in these series of cases. My own experience has taught me that pulmonary embolism is a frequent complication of cesarean section no matter what type is employed and must be taken into account when making the decision of operation in any case.

TABLE XII. FETAL MORTALITY

EXTRAPERITONEAL

2 children were delivered; both survived.

TRANSPERITONEAL

59 children were delivered and 7 did not survive, a fetal mortality of 11.8 per cent. The causes of death were the following:

Stillborn	2
Macerated fetus	1
Prematurity	1
Premature twins, atalectasis pulmonum	2
Atalectasis pulmonum	1

INTRAPERITONEAL

Longitudinal Incision

163 children were delivered, there being 3 sets of twins and 9 did not survive, a fetal mortality of 5.5 per cent. The causes of death were the following:

Stillborn	5
Macerated fetus	2
Congenital heart disease	2

Transverse Incision

199 children were delivered and 9 did not survive, a fetal mortality of 4.5 per cent. The causes of death were the following:

Stillborn	4
Prematurity, 7½ months, mother had central placenta previa	1
Prematurity, 7 months, mother had hydramnios, fifth cesarean	1
Term, mother had acute hydramnios, sixth cesarean	1
Status lymphaticus	1
Hemorrhage of newborn, atalectasis pulmonum	1

423 children were delivered and 25 did not survive a gross fetal mortality of 5.9 per cent.

All of the figures quoted in this study are gross figures. None of the statistics were corrected.

There were 105 repeated operations, deducting 17 transperitoneal operations in which we always find a band of adhesions, we have 88 cases for study. Of these 88 cases, 25 had adhesions as described above and 63 had no adhesions whatsoever. The very important point in this study is the fact that in 105 repeated operations no intestinal adhesions of any kind were encountered.

TABLE XIII. REPEATED CERVICAL CESAREAN SECTIONS

For the purpose of this study the operations done with a longitudinal incision are grouped together as are those which were performed with a transverse incision in the lower segment. The first three groups, extraperitoneal, transperitoneal and intraperitoneal with a longitudinal incision, all having had longitudinal cervical incisions, total 220. The second group consists of 198 operations with a transverse cervical incision.

Cervical cesarean sections		418
With a longitudinal cervical incision	220	
With a transverse cervical incision	198	

REPEATED OPERATIONS

LONGITUDINAL INCISION			TRANSVERSE INCISION
6 cervical cesareans on	1 woman	6	36 cervical cesarean sections were performed on 18 women. In other words, 18 women had two cervical operations with the transverse incision.
5 cervical cesareans on	2 women	10	
4 cervical cesareans on	4 women	16	
3 cervical cesareans on	10 women	30	
2 cervical cesareans on	42 women	84	
Total		146	

TABLE XIV. CERVICAL SCARS

LONGITUDINAL INCISION	TRANSVERSE INCISION
146 operations were performed on 59 women, therefore, 87 previous scars were examined during repeated operations.	36 operations performed on 18 women, therefore, 18 previous scars examined during the repeated operations.
84 scars were solid and invisible to the naked eye.	17 scars were solid and invisible to the naked eye.
3 scars (3.4 per cent) were defective.	1 scar was very thin. This woman had had 3 cervical cesarean sections with the longitudinal incision. The fourth was performed with a transverse cervical incision. The fifth was also performed with a transverse cervical incision. It was noted at the fifth operation that the lower segment as a whole was very thin.
2 of them were thin.	
1 of them which had been extended into the uterine body for the extraction of a voluminous fetus, was solid in its cervical part, but thinned out for an area 2.5 × 2.5 cm. in its corporeal portion.	

There were no ruptured scars in this series of cases.

TABLE XV. PELVIC DELIVERIES FOLLOWING CERVICAL CESAREAN SECTION

LONGITUDINAL INCISION	TRANSVERSE INCISION
8 parturient women were delivered through the pelvis as follows:	3 parturient women were delivered through the pelvis as follows:
3 parturients were delivered by medium forceps.	1 parturient was delivered by the Scanzoni maneuver for R.O.P.
1 parturient was delivered by the Scanzoni maneuver for R.O.P.	1 parturient had an internal podalic version and breech extraction.
1 parturient had 3 normal deliveries.	1 parturient had a normal delivery.
1 parturient had 2 normal deliveries.	
2 parturients had 1 normal delivery.	

The puerperium was normal in these 11 women who had 14 pelvic deliveries. Thirteen of the babies who had been delivered at term survived. One baby, a premature of six months, lived a few hours after a normal delivery.

TABLE XVI. POSTOPERATIVE ADHESIONS

EXTRAPERITONEAL
The woman who had an extraperitoneal cesarean section and recovered was subsequently delivered by a Porro cesarean section because she was again admitted after a long labor and frankly infected. The bladder was adherent on the left side of the uterus but was separated without undue difficulty in performing the hysterectomy.
TRANSPERITONEAL
This operation was not repeated but 17 women had intraperitoneal cervical cesarean sections performed subsequently, either with a longitudinal or a transverse incision of the lower segment. In these 17 cases a band of peritoneum varying in width was found extending from the cervix to the parietal peritoneum. This band was resected before separating the bladder for the second time.
INTRAPERITONEAL
Longitudinal Incision
Adhesions were encountered in 22 patients, one band of peritoneum from the bladder to the abdominal incision in 8 cases, 2 bands in 4 cases and 3 bands in one case. A small omental adhesion to the parietal peritoneum in 5 cases. A small omental adhesion to the uterine fundus in 2 cases; in one of these cases it was the fourth and in the other the third operation. The bladder was adherent to the parietal peritoneum in 2 cases.
Transverse Incision
Adhesions were found in 3 patients. In one woman who had had a classical and a transverse cervical cesarean one band of peritoneal adhesions was found to the classical scar, none to the cervical. In another patient who had her sixth operation, 1 transperitoneal, 3 intraperitoneal with longitudinal incision and 1 intraperitoneal with transverse incision. A small omental adhesion was found at the upper angle of the abdominal incision when performing the sixth operation. In still another patient there was a band of peritoneum extending from the bladder to the parietal peritoneum at the second intraperitoneal operation with transverse cervical incision.

SUMMARY AND CONCLUSIONS

This study is based on 418 cervical cesarean sections, extraperitoneal 2; transperitoneal 58; intraperitoneal with a longitudinal cervical incision 160; intraperitoneal with a transverse cervical incision 198.

These operations were performed by the author in 31 hospitals varying in equipment from that of the large metropolitan hospital to that of the small country hospital.

The cervical cesarean section seems to fulfill the three main considerations claimed for it by its advocates, namely, protection against septic peritonitis, better healing of the incision and an easier convalescence.

The uncorrected maternal mortality was 5.0 per cent. The best maternal mortality statistics were obtained in 198 consecutive transverse cervical cesarean sections where it was 3.0 per cent.

Pulmonary embolism gave the highest maternal mortality rate, 1.19 per cent. For purposes of comparison, 53 consecutive classical cesarean sections, with a high fundal incision, performed by the author were analyzed; the maternal mortality from pulmonary embolism was 3.7 per cent, three times higher than in the reported series of cervical cesarean sections.

From this study it is apparent that pulmonary embolism is a frequent complication of cesarean section no matter what type is employed. This fact should be taken into consideration when deciding to perform an abdominal delivery.

The gross fetal mortality was 5.9 per cent as explained in Table XII.

The cervical cesarean section may be repeated with ease. The highest number performed on one woman was 6 (Table XIII).

There were 14 pelvic deliveries in 11 women following the cervical cesarean section. The puerperium, in all of them, was normal.

In 105 repeated operations no intestinal adhesions were found.

In performing the intraperitoneal operation I prefer the transverse cervical incision to the longitudinal.

An efficient test of labor may be safely given in border line cases, thus allowing a number of women to deliver themselves through the pelvis who otherwise might have been delivered abdominally.

270 COMMONWEALTH AVENUE.

(For discussion, see page 597.)

Tholen, G. A.: The Treatment of Postoperative and Puerperal Thrombosis and Embolism. Wien. klin. Wchnschr. 42: 1107, 1929.

Treatment of postoperative and puerperal thrombosis by means of the leech depends upon the action of the hirudin, elaborated in the head of the leech, which when injected into the patient through its bite, causes a marked increase in the coagulation time of the blood and thus prevents thrombosis.

The author reports 49 cases, the majority of them postpartum, which he treated by this method with very favorable results. His method consists in early application of 2 or 3 leeches to the area involved for a period of thirty to sixty minutes. Subsequent hemorrhage is controlled by pressure. If symptoms of thrombosis persist after two days the procedure is repeated. In his first series of 17 cases of puerperal thrombosis, 13 reacted well, 2 showed no effects, and 2 developed phlegmasia alba dolens. These latter 2 were first treated long after the first onset of symptoms. One case, apparently improving under treatment, subsequently developed a pulmonary embolus resulting in death.

A thrombus already formed is little affected by hirudin, and it is for this reason that the author stresses the introduction of the treatment as soon as possible after the appearance of symptoms.

FRANK SPIELMAN.

ATELECTASIS, ASPHYXIA AND RESUSCITATION IN THE NEWBORN*

Anatomic, Physiologic, and Experimental Data

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ACTIVE and rhythmic respiration in the well-developed newborn is not established unless the respiratory apparatus and the respiratory center present anatomic and physiologic integrity. Normal conditions of the respiratory apparatus, namely patency of the larynx and bronchi, are necessary for insuring adequate gas exchanges in the alveoli between alveolar air and alveolar blood. Thus, and only thus, the partial pressures of O_2 and CO_2 and the acid-base equilibrium in the circulating blood can be maintained under conditions which are indispensable for the normal functioning of the respiratory center. Conversely, anatomic or physiologic impairment of the respiratory center will embarrass or prevent the establishment of spontaneous and rhythmic respiration and if this condition is not promptly relieved anoxemia and death of its nervous cells will follow. Besides the "chemical factors, there are "nervous" stimulants playing an important part in the establishment and maintenance of the rythmic respiratory movements, which conversely, contribute to maintain, with an extreme accuracy, "constant the conditions of life in the internal environment" (the blood) as Claude Bernard has put it.

The above considerations show clearly the intimate and close interrelation of the respiratory apparatus and the respiratory center, and the impossibility of separating them in the study of asphyxia of the newborn. In this paper I am especially concerned with the anatomic and physiologic disturbances of the respiratory apparatus, namely, atelectasis and allied conditions of the lung and with ensuing changes in respiratory gas exchanges which affect the "humoral control of respiration." I shall be compelled, however, to deal with the "nervous control of respiration" in order to explain and justify my views on resuscitation.

RESPIRATORY APPARATUS

1. In the fetus and the newborn before the first breath is drawn, the lung is airless; the alveoli are collapsed, the parenchyma is fleshy in consistence, dark in color, does not crepitate and sinks in water. This is the condition, designated by the terms of fetal lung or atelectasis

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or apneumatosis, which is often reproduced in the adult when bronchial obstruction causes alveolar air to be absorbed by the blood of the alveolar capillaries. (Coryllos and Birnbaum.[1, 2]) These lungs fill the thorax completely, so that there is no negative intrapleural pressure, and on opening the thoracic wall collapse of the lung and pneumothorax will not be produced as in grown-up persons. Thus the lung is represented at that period of life by a compact and solid viscus, like the liver, which completely fills the thorax. With the first respiration the thoracic cavity expands and the diaphragm contracts so that a disproportion between the thoracic capacity and the initial volume of the lung is created. It is only later, however, that a real discrepancy in size will be established due to the rapid growth of the ribs and the vertebral column. The lung is thus distended and its elastic recoil leads to the formation of a more marked intrapleural "negative" pressure.

Circulation in the atelectatic lung is limited to the bronchial vessels. Little or no blood circulates in the intrapulmonary system of the pulmonary artery, but it is short circuited from right to the left heart through the foramen ovale and to the aorta through the truncus arterio-venosus.

The first respiratory movements, immediately after birth produce important changes in the lungs both anatomic and physiologic. The lung will dilate little by little and expand. This increase in size however is not accomplished as in a balloon; the lung "opens" like a lady's fan according to the expression of Arthur Keith.[3] The capacity of the lungs during the first hours does not exceed 30 to 50 c.c. (Henderson,[4] Wasson,[5] Von Reuss,[6] Dorn and Recklinghausen[7]) and often it takes several days before expansion is complete. It is accomplished more during forced expiratory movements with closed or narrowed glottis, as when the baby cries, than during quiet respiration. Furthermore in the "opening" of the alveoli a resistance has to be overcome represented by the cohesion and capillary tension of the alveolar walls which are in contact in the fetal lung. In our experimental investigations, Dr. Birnbaum and myself,[8] have found that a positive pressure equal to 14 cm. of water is necessary to inflate the atelectatic lung in the dog. This point, to my knowledge, never mentioned before, is of paramount importance in resuscitation. It shows clearly that inflation of the lungs in the newborn is a rather slow procedure; it explains why for several days or even weeks, large atelectatic areas can persist in the lung (Wasson,[5] Von Reuss[6]) and above all the ease with which bronchial obstruction can oppose the relief of atelectasis. The expansion of the alveoli has as an immediate result the opening-up of the perialveolar capillaries, tributaries of the pulmonary artery. This opening develops at the same time with inflation of the alveoli and in fact, depends upon it. This is another proof of

the interdependence of ventilation and circulation in the lung; it reinforces the theory which we defended in a previous paper[9] on the circulation in the atelectatic and consolidated lung (in atelectasis, lobar pneumonia and bronchopneumonia), that, conversely, when the alveoli collapse the circulation in the alveolar capillaries is practically suspended. In the newborn the immediate result of the opening of the alveolar capillaries is that the blood of the pulmonary artery flows toward the lungs, where resistance (14 mm. Hg) is considerably smaller than in the left heart and the aorta (140 mm. Hg). The foramen ovale gradually closes as the blood no longer impinges against the eustachian valve as it did during intrauterine life. In this way all the blood is directed toward the lung and the pulmonary circulation is established.

From the above considerations it becomes obvious that persistence of atelectasis in the newborn will be followed by the most severe respiratory and circulatory disturbances. If atelectasis is very extensive, and not promptly relieved, death will rapidly follow because of asphyxia, the mechanism of which I shall study more closely later. If it is only partial and represented by atelectatic areas, lobar or lobular, and distributed throughout the otherwise well aerated lungs it may be the origin of infectious complications such as pneumonia or bronchopneumonia which cause a tremendous mortality in the newborn and especially in those who have presented respiratory troubles at birth. In a recent thorough statistical study, Yandell Henderson[4] arrived at the conclusion that combined stillbirth and neonatal deaths due to respiratory complications amount to nearly 8 per hundred births, that is, to over 150,000 deaths a year in this country alone. The question consequently is of importance and deserves a closer study.

RELATION OF ATELECTASIS TO PULMONARY INFECTIONS

The relation of atelectasis to bronchial obstruction cannot be questioned in the newborn as it has been and still is in the adult. Furthermore it constitutes a further proof in favor of the obstructive origin of any form of atelectasis and shows clearly the paramount importance of bronchial obstruction in acute and chronic lung infections. The succession of the different phases: bronchial obstruction, atelectasis, impaired bronchial drainage, bronchial stasis-infection, is presented in the newborn in an almost schematic way. No "previous conditions" intervene here to befog the etiologic relationship between the first and the latter; furthermore the absence of "negative" intrapleural pressure and of circulation in the lung show the futility of the theories which attribute atelectasis to paralysis of the diaphragm or to bronchomotor or vasomotor reflexes. Most important of all however is the evidence brought in favor of our[10, 11]

theory that lobar pneumonias, and bronchopneumonias, medical as well as postoperative are really infectious, massive, lobar or lobular atelectases. It is my contention that all pneumonias and bronchopneumonias in the newborn start as lobar or lobular atelectases, due to obstruction of lobar or lobular bronchi. If the obstructing agent is artificially or spontaneously eliminated the lung will be reaerated, its free drainage insured and its means of defense restored. If, on the contrary, bronchial obstruction persists, the atelectatic and undrained area of the lung, in which bronchial exudate is accumulating, can easily be secondarily infected by microorganism coming from the nasopharynx and upper respiratory tract; thus, an aseptic atelectasis will be transformed to a septic one, and pneumonia or bronchopneumonia will develop, according to the distribution of the atelectasis

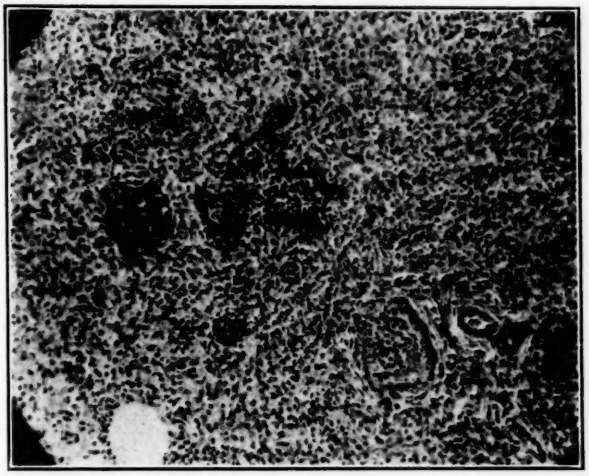

Fig. 1.—Persistent atelectasis in a newborn due to bronchial obstruction.

and the nature of the infecting agent. The fact that these conditions are developed on atelectatic areas, which were obviously aseptic at the beginning, and that the causative infecting microorganisms identified in them were present also in the nasal and pharyngeal cavities of these patients establishes the succession and the pathogenesis of the lesions.

Cruickshank[12] in his special report of the Medical Research Council on the causes of neonatal death, gives the results of 800 autopsies; 179 among them were pneumonias, so that "the frequency of pneumonia was practically 23 per hundred deaths." He further adds, "many of these cases which have been placed in the group of 'deaths from infection' were doubtless predisposed to these infections by the effects of birth asphyxia. It is obvious that a deeply congested and imperfectly expanded lung is much more liable to the development of pneumonia than one in which circulation and aeration are free." Peiser (in von Reuss,[6] Diseases of the Newborn) states that "Pneumonia, which is very apt to supervene when the risk of infection exists in the atelectatic portion of the lung is a very frequent cause of

death in infants,'' and further he concludes that ''the treatment of atelectasis must be directed toward expanding the lungs by stimulating deep respirations.'' Von Reuss[6] is even more explicit: ''among resuscitated from stillbirth 20-30 per cent succumb to sequelae, especially in the first two days, while through the first week the mortality among such infants is seven times the rate of those born

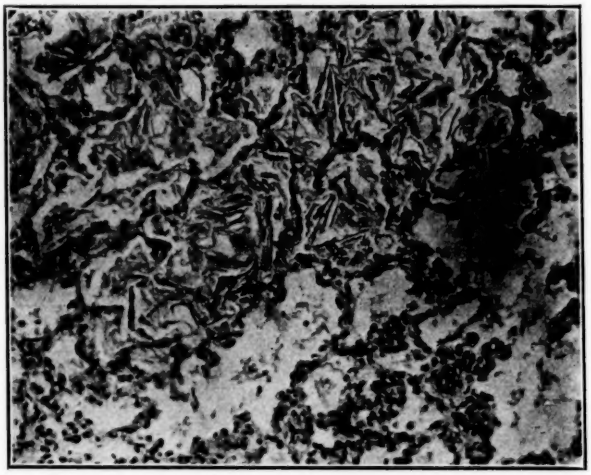

Fig. 2.—Epidermic cells in the alveoli, following premature respiratory movements and aspiration of amniotic fluid.

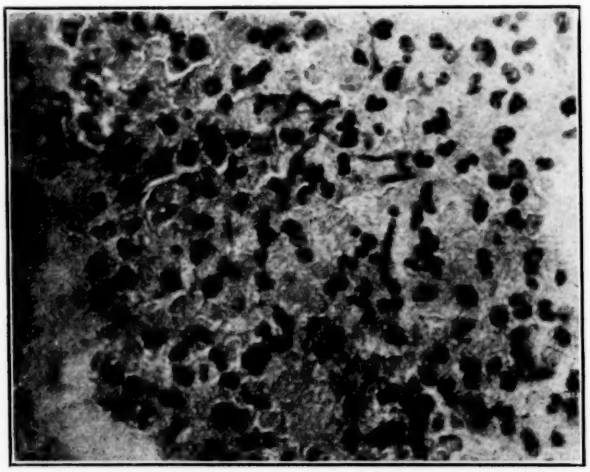

Fig. 3.—Greater enlargement of Fig. 2, showing the epidermic cells.

normally,'' he adds that in the majority of cases this is due to atelectasis and to the danger of inflammatory complications in the atelectatic portions of the lung (Y. Henderson[4]).

The obstruction is generally due to the mucous exudate. It can, however, in cases of difficult and asphyxial birth be meconium or even epidermic cells manifestly aspirated with amniotic fluid. In these cases we deal with real intrauterine submersion. Figs. 1, 2, and 3

show atelectatic areas due to bronchial obstruction with cells, which are to be found even in the alveoli.*

The above data, which establish I believe the relation between atelectasis and inflammatory complications of the lung, present striking similarities to postasphyxial pneumonias observed in cases of CO_2 poisoning (Y. Henderson, 1930) which developed on atelectatic areas of the lung and which can be prevented by having the lung well expanded, as occurs when these patients are resuscitated by the O_2-CO_2 inhalational treatments of Henderson and Haggard. Upon the same principle are based prevention of postoperative lung complications[14] and treatment of lobar pneumonia.[15]

DISTURBANCES OF "HUMORAL" AND "NERVOUS" CONTROL RESPIRATION

Asphyxic phenomena in the newborn, in absence of serious damage of the respiratory center, can be likened to respiratory troubles occurring when a resistance is offered to respiration. This resistance can be strong, producing almost complete obstruction of the respiratory ways, or only weak and partial.

Davies, Haldane and Priestly[16] showed (1919) that a strong resistance to respiration produces first slowing and deepening of the respiratory rate. This is due to the fact that, because of the resistance, complete inspiratory distention or expiratory collapse are slow to be established. It is known, that in the so-called Hering-Breuer[17] reflex, as we shall see later, pulmonary distention inhibits inspiration and starts expiration, and vice versa, expiratory collapse inhibits expiration and starts inspiration. The slowing of the respiration has as result the accumulation of CO_2 and the increase of its tension in the arterial blood, which acting upon the center, produces more vigorous respiratory movements tending to reestablishment of normal respiratory rate. But as this cannot be accomplished because of the resistance, after a period of strong and deep respiratory movements, shallow and rapid breathing will be established due to anoxemia, rapidly followed, if obstruction is not immediately relieved, by decompensation of the respiratory center, and death.

These authors and later Dautrebande[18] (1924) showed that even weak resistances act in a very similar way; at the beginning the respiration is slowed, but as CO_2 accumulates respiratory movements become deeper and stronger and thus, because of the weakness of the resistance, the normal respiratory rate is established. A new type of respiration is established, of normal rate but of increased depth and volume of tidal air. If this condition is prolonged, especially in the newborn in which the pulmonary capacity is very limited, periodic respiration will be established, often Cheyne-Stokes' type, due to fatigue of the center and will be followed by rapid shallow breathing which increases anoxemia still further and leads to decompensation of the respiratory center and death. Dautrebande and Delecourt[19] (1928) showed that in this period even oxygen administration might be without effect. Without entering into great physiologic detail I shall give a brief résumé of the intimate mechanism of the respiratory disturbances described above which are necessary for a better comprehension of the requirements for the resuscitation methods.

*These slides were prepared by Dr. M. A. Goldzieher, Pathologist to Israel Zion Hospital.

Let us consider first the pathologic physiology of the atelectatic areas. If atelectasis is complete and limited especially to one lobe, it will cause no other trouble than slight and temporary anoxemia due to the decrease of the respiratory field. In fact this portion of the lung will be shut off not only to ventilation but also to circulation, because complete collapse of the alveoli is always accompanied by complete collapse of the alveolar capillaries.[9] In that way there will be no circulation through unaerated pulmonary channels. It is not the same with disseminated and incomplete atelectatic areas in which the alveoli are partially distended, although their ventilation is very deficient. In these cases circulation will keep on, and thus a more or less considerable amount of blood will return to the left auricle insufficiently oxygenated. It is obvious that in the cases of incomplete atelectasis the arterial blood of the left heart will be polluted by the blood which has passed through insufficiently aerated channels of the lung, so that the hemoglobin will be incompletely saturated, whereas CO_2 tension will increase. In these cases hyperpnea and intense cyanosis will be present.

It is interesting to notice here that atelectasis is maintained in the newborn by the same mechanism by which it is produced in the grown-up, namely, bronchial obstruction. In the latter apneumatosis (airlessness) is produced by absorption of the alveolar gases by the blood circulating in the alveolar capillaries. This absorption is accomplished according to the laws which normally regulate gas exchanges in the lungs. (Table I.) In other words, atelectasis or apneumatosis is a normal phenomenon following an abnormal ventilation. If the alveolar respiratory membrane is healthy and the circulation normal, this phenomenon depends upon, and is regulated, by the partial pressures of the gases in the alveoli and in the blood.

Hyperpnea is due to increase of CO_2 (Miescher,[20] 1881, Haldane and Smith,[21] 1893) or more exactly to the reaction of the blood, which depends upon hydrogen-ion concentration, conventionally expressed by P_H. This is in great part a function of the fraction

$$\frac{H_2\text{-}CO_3}{NAH\text{-}CO_3}$$

in which the nominator is the pressure of CO_2 in solution in the blood, expressed as carbonic acid, and the denominator is the total volume of CO_2 in the blood expressed as sodium bicarbonate. It is obvious that the P_H will be unchanged as long as the ratio of acid to base is constant, and this independently of their individual variations.

Fig. 5 gives the dissociation curve of CO_2 in the arterial and venous blood. It shows that when the pressure of CO_2 in the blood increases the total volume of CO_2 (bicarbonate) increases correspondingly. Conversely a drop of CO_2 pressure is accompanied by drop in bicar-

bonates. In the case of increase of CO_2—we deal with acidosis, in the second—decrease of CO_2—with alkalosis, which are called gaseous, in order to be distinguished from nongaseous acidosis and alkalosis which are due to primary variations of the bicarbonates; as for instance in ingestion of bicarbonates (nongaseous alkalosis) or in the presence in the blood of nonvolatile acids which attack the bicarbonates as in diabetes (nongaseous acidosis).

TABLE I

	ALVEOLAR AIR			VENOUS BLOOD	
	PER CENT	PARTIAL PRESSURE IN MM. Hg.		PER CENT	PARTIAL PRESSURE IN MM. Hg.
O_2	15	114	O_2	5	38
CO_2	5	38	CO_2	6	45.6
N_2	80	608	N_2	-	608

Table I.—Showing the relative partial pressures of O_2, CO_2 and N_2 in mm. of Hg.

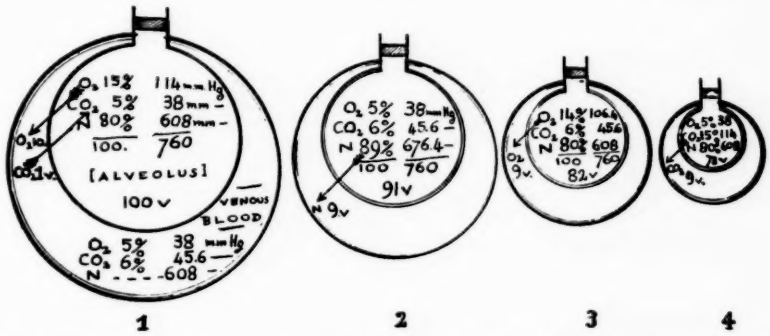

Fig. 4.—A schematic representation of alveolar gas exchanges, gradual gas absorption and shrinkage of the alveoli after complete bronchial obstruction. The absolute volume of the alveolus is only approximately indicated, but the figures given are relative and demonstrate perfectly well the principles involved. In *1*, ten volumes of oxygen diffuse into the venous blood and one volume of carbon dioxide diffuses out of the venous blood into the alveolus. In *2*, the alveolus has now lost nine volumes of gas as stated under (*1*) and the oxygen and carbon dioxide have come into equilibrium in the venous capillary blood and in the alveolus. However the percentage and partial pressure of nitrogen have now been increased so that nine volumes of nitrogen diffuse out of the alveolus into the venous blood. In *3*, nine volumes of nitrogen having previously diffused out of the alveolus into the venous blood, the percentage and partial pressure of oxygen or carbon dioxide have been relatively increased. For purposes of explanation let us say the oxygen has been alone thus relatively increased in percentage and partial pressure. Nine volumes of oxygen are now ready to diffuse out of the alveoli into the venous blood. In *4*, nine volumes of oxygen having diffused from the alveolus into the blood, we can now consider that the carbon dioxide in the alveolus is relatively increased by these nine volumes. Thus the partial pressure of this gas is relatively increased and carbon dioxide is ready to diffuse out of the alveolus. Thus the cycle continues until all gases of the lung are absorbed, although actually the gas exchanges are going on simultaneously and not in the isolated way which we have ideally considered. (After Coryllos and Birnbaum.[2])

The regulation of the acid-base equilibrium is insured in a remarkably sensitive way by the blood, the respiratory center, the kidneys and the liver; however, we can say that all the tissues of the organism contribute to the accurate maintenance of this equilibrium.

The immediate results of resistance to the respiration will be a decrease in oxygen and increase in CO_2 tension; the alkali of the blood will increase (Henderson and Haggard,[23] 1918), in other words the curve of dissociation of CO_2 will rise; at the same time the respiratory center will be stimulated and hyperpnea will be induced tending to wash out excess of CO_2. But if, because of the resistance, hyperventilation is not able to produce adequate decrease in the pressure of CO_2, the ensuing acidosis may be compensated by increase of the total CO_2 in the blood (bicarbonates). The prolongation of this condition will produce in the newborn results very similar to the ones observed in dogs which have been maintained for a long while in a

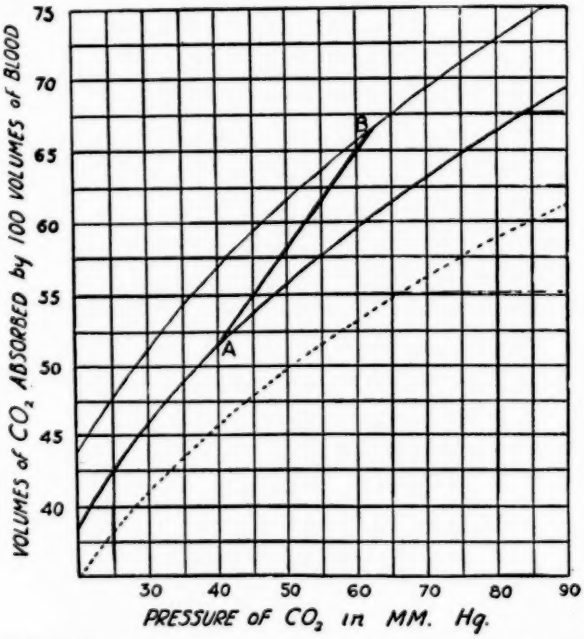

Fig. 5.—A schematic representation of my theory of production of atelectasis.
This curve shows the influence of the saturation of the hemoglobin with oxygen on the amount of CO_2 taken up by the blood at various pressures.
Upper curve: Absorption of CO_2 by human blood in presence of hydrogen and CO_2.
Middle curve: Absorption of CO_2 by human blood in the presence of air and CO_2.
Lower curve: Absorption of CO_2 in blood of ox and dog in presence of air.
The thick line A-B represents the absorption of CO_2 by human blood within the body (supposing the blood is completely deoxygenated in the tissues).
It is evident that an increase of 15 c.c. per cent of CO_2 in the blood, passing through the tissues, would raise the tension of this gas in the blood only 22 mm. Hg (from 40 to 62). Under normal conditions the rise of CO_2 pressure in the blood on passing through the tissues is not more than 5 or 7 mm. Hg. (Starling.)

chamber with increased CO_2 tension (6 to 10 per cent) in the atmospheric air (Henderson and Haggard[23]). These animals get adjusted to the high percentage of CO_2 because their alkali increases correspondingly; if they are placed again in pure atmospheric air in which CO_2 tension is only 0.03 per cent, they present a very prolonged apnea which may kill them by anoxemia. I would suggest the following

explanation for this phenomenon. The elimination of the CO_2 being much more rapid than the adjustment of the bicarbonates, the animals present a real alkalosis to which the respiratory center responds by apnea. It seems to me that this explanation is, in the case of newborn asphyxia, more suitable than the one given by Henderson and Haggard, namely, that the respiratory center becomes adjusted to higher levels of CO_2 and requires greater concentrations of it to be stimulated, for two reasons. First because in the cases of asphyxiating newborn there is always anoxemia present which lowers the threshold of existability of the respiratory center to CO_2, which means that the center becomes more sensitive to CO_2. Second because the real

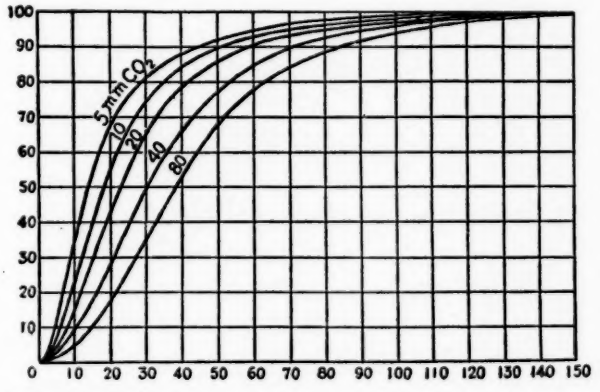

Fig. 6.—Curves representing the percentage of hemoglobin with oxygen at different partial pressures of O_2 and CO_2. Dog's blood at 38°C. Ordinates indicate percentage saturation with O^2. Abscissa shows partial pressure of O_2 millimeter of mercury. (Rohr, Hasselbach and Krogh.)

respiratory hormone is the P_H of the blood, so that the important factor is not the absolute value of CO_2 but the value of the ratio $\frac{H_2CO_3}{NAH\ CO_3}$. This fact has to my mind a paramount importance in the choice of methods of resuscitation as we will see later.

A second phenomenon which may occur following hyperventilation with ordinary atmospheric air is the "Bohr phenomenon." In spontaneous hyperpnea or artificial ventilation, when unaerated channels still persist in the lung because of bronchial obstruction, increase in anoxemia and decompensation of the respiratory center may occur, although cyanosis decreases or disappears. Bohr[24] has shown that hyperventilation will wash out CO_2 more efficiently than it will increase the O_2 saturation of hemoglobin. The first because CO_2 is 32 times more diffusible than O_2 so that it will diffuse into the alveolar air and wash out very rapidly. It is not the same for the O_2. In Fig. 6, which represents the curve of dissociation of oxyhemoglobin in various pressures of CO_2, an easy explanation of this fact is given. When O_2 is present in the alveolar air under a pressure of 90 mm.,

corresponding to 12 per cent in volume, hemoglobin is almost completely transformed to oxyhemoglobin 90 per cent. Consequently even a considerable increase of O_2 per cent tension in the alveolar air will have almost no effect upon the saturation of hemoglobin; so it cannot greatly modify the average O_2 saturation of hemoglobin of the mixed blood, which is polluted by the nonarterialized blood passing through unaerated pulmonary channels. But on the other hand this hyperventilation will have a disastrous effect, because of the lowering of the pressure of CO_2. As it is apparent in the above curve, with a pressure of O_2 of 35 mm. Hg. (4.6 per cent), and a normal pressure of CO_2 (5 per cent, equal to 40 mm. hg.) only 50 per cent of hemoglobin will be transformed in oxyhemoglobin so that strong cyanosis will be present. But if the amount of O_2 remaining the same, CO_2 is washed out so that its pressure falls to 5 mm. Hg. (0.51 per cent) hemoglobin will be 82 per cent saturated so that cyanosis will disappear. But oxyhemoglobin under these conditions holds fast to the O_2, so that it does not give it up easily to the tissues, and in this way, although cyanosis decreases, giving the false impression of a better oxygenation, anoxemia really increases and the life of the patient is threatened more than ever. I really believe that the "Bohr effect," which I have never seen mentioned in relation to resuscitation in asphyxia, is of an overwhelming importance in it, not only because it explains a number of failures heretofore puzzling and inexplicable, but also because it clearly shows the importance of CO_2 in resuscitation and respiration.

A third phenomenon is "acapnia" described by Henderson in 1909. This author showed that hyperventilation with ordinary air, in washing out CO_2 produces apnea which naturally causes anoxemia; when CO_2 is allowed to accumulate again, as anoxemia has rendered the respiratory center more sensitive to CO_2, hyperpnea will be established at a lower level of CO_2 concentration, so that the CO_2 will be washed out more rapidly and before hyperpnea has had the time to compensate anoxemia. In this way a vicious circle can be established, especially in cases in which the respiratory center is already damaged so that rapid shallow breathing will follow hyperpnea and periodic respiration.

A last point which is necessary to study in order to have in hand all the elements of the "nervous control" of the respiration which are indispensable in the study of resuscitation, is the part played by the vagi in the so-called Hering-Breuer reflex. "Though through stimulation of other sensory nerves of the body," says Starling,[25] "the respiratory movements can be altered reflexly, it is only through the vagi that a continuous stream of impulses pass to the center under normal circumstances so that every respiratory movement is modified by these impulses."

The vagi contain two kind of afferent fibers or at any rate afferent fibers with two functions. Stimulation of the first kind stops inspiration and produces expiration; stimulation of the other stops expiration and produces inspiration. The first are stimulated when the lungs are collapsed. This is known as the "Hering-Breuer reflex." It can be shown by simply closing the trachea at the end of inspiration or of expiration. But the action of this reflex is much more marked when by a tube introduced in the trachea the lungs are rhythmically inflated and collapsed. The inflation produces an instantaneous and complete relaxation of the diaphragm; collapse of the lung, on the contrary, produces a tonic contraction of the diaphragm. Lumsden[26] admits the existence of two sets of afferent fibers in the vagi which are respectively stimulated by the passage of the air through the trachea and the bronchi. So that blowing downward through the upper part of the trachea causes expiration, while a current of air upward causes inspiration. The Hering-Breuer[18] reflex is completely suppressed when the vagi are suctioned (Starling[25]).

RESUSCITATION

From the above consideration it follows that the anatomic and physiologic requirements for a rational procedure of resuscitation are: Remove or lessen any resistance to the respiration, relieve anoxemia as quickly as possible, assure a good expansion of the lungs and prevent washing out of CO_2.

We shall lay aside the old methods of "swinging, spanking and chilling" the newborn. They are empiric and unscientific methods, which can render some services in extreme emergency but generally do more harm than good. Manual artificial respiration should be also completely discarded as inefficient because of the anatomical conditions already dealt with and as dangerous because of the ease with which ribs can be fractured and the liver damaged.

Inflation of the lungs of the newborn baby by mouth to mouth insufflation is a more rational method, the best of all empiric methods, provided that obstructing agents are previously removed. It helps the inflation of the lungs with air containing a fair amount of CO_2 (3 to 5 per cent). It presents, however, the great danger of rupture of the alveoli, a complication generally fatal.

The remaining methods are three:

1. Inhalation of a mixture of 6 to 10 per cent of O_2-CO_2 with an ordinary anesthesia mask, as proposed by Henderson and Haggard.

2. Intratracheal suction and insufflation with the same mixture as proposed by Flagg.[27]

3. Mechanical prolonged, passive artificial respiration, devoid of the dangers of manual artificial respiration, by using differential negative pressure as used in the respirator of Drinker and Shaw.[28]

The first two have the great advantage over the third in that they use CO_2. The presence of this gas constitutes an absolute physiologic necessity which has been shown, stressed and popularized by Y. Henderson and Haggard who rendered a real service in so doing. More particularly each of these two procedures has its special indications. In cases of slight asphyxia the method of Henderson and Haggard is recommended by its simplicity in instrumentation and modus operandi. In cases of advanced asphyxia, I personally prefer the method of Flagg. The question of instrumentation has been simplified by the construction by this author of a handy laryngoscope, a special short and small diameter intratracheal tube and a water manometer-safety valve. As far as the technic is concerned, I earnestly believe that every physician can and should be familiarized with it. In the cases of advanced asphyxia, in which this method is especially indicated, the absence of laryngeal reflex renders the procedure easy and harmless. On the other hand it presents in advanced cases, the following advantages upon any other method: first, it clears the larynx and the trachea of any possible obstruction by initial suction through the tracheal tube, and also, it clears the big bronchi themselves, by the return current created by the insufflated air. Second, it is a rapid method, because it brings directly to the lung the necessary amount of CO^2-O_2, and it insures the perfect and complete inflation of the organ. Third, and this is a marked advantage, it overcomes the cohesion of the collapsed alveolar walls and puts to work the powerful Hering-Breuer reflex. I had the opportunity to use this method in studying resuscitation of drowned human beings and experimental animals and in cases of ether syncope. I have been strongly impressed by its great efficiency and its rapid action.

The method of Drinker and Murphy is an excellent procedure when a prolonged artificial respiration is necessary as in toxic inhibition of the respiratory center by alcohol, morphine or other narcotics, or in cases of paralysis of the respiratory muscles as in acute poliomyelitis. I do think that it does not present the same advantages in resuscitation of the newborn, because it neglects the two fundamentals necessary for successful resuscitation: the anatomic one, which is the patency of the respiratory ways, and, more especially, the physiologic one which is the absolute necessity of the presence of CO_2 in high concentrations in the respiratory air given to the newborn. It must not be forgotten, however, that in cases of cerebral hemorrhage this method associated with O_2-CO_2 inhalations can render important services.

SUMMARY AND CONCLUSIONS

1. Asphyxia in the newborn is a complicated phenomenon, due to anatomic deficiency of the lungs, defective gas exchanges and physiologic imbalance of the respiratory center.

2. The anatomic factor, namely, persistent fetal or partial atelectasis of the lung, is always due to bronchial obstructions. It threatens by immediate or delayed asphyxia, because of anoxemia due to defective gas exchanges, and predisposes to infectious complications, such as pneumonia or bronchopneumonia, to which are due the most important number of neonatal deaths.

3. The importance of the curves of dissociation of oxyhemoglobin and of CO_2, and especially their interrelation in the study of asphyxia of the newborn has been shown.

4. The "Bohr effect" and the "Hering-Breuer" reflex have been studied and their significance in resuscitation has been insisted upon.

5. The different procedures for resuscitation, more especially of Henderson and Haggard, of Flagg and of Drinker have been presented and discussed.

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(For discussion, see page 600.)

THE MECHANISM OF LABOR FROM THE NEUROLOGIST'S POINT OF VIEW*

By Bronson Crothers, M.D., Boston, Mass.

THE neurologist regards labor with a great deal of awe and regards obstetricians as extremely bold persons who are performing very delicate physiologic experiments with powerful instruments wielded by powerful forces. The neurologist thinks of the fetus as a rather delicate nervous system surrounded by pliable and rather fragile envelopes of bones, muscles, and skin. He visualizes the process of labor as a series of pressure changes involving almost directly the tissues of the central nervous system, and he is inclined to believe that the obstetrician has not carried his conception of the mechanism of labor inside the craniovertebral cavity.

Naturally, nobody has any distinct evidence as to the pressure changes within the craniovertebral canal during labor, but it is possible to reason out a mechanism which seems to fit the known facts. If this attitude is treated with any respect, it follows that the obstetrician is responsible for watching a whole series of phenomena, not from the point of view of progress up or down a canal but from the point of view of shifting pressures within a closed cavity.

During the process of descent through the pelvis the fetal head is subjected to tremendous compression. It seems reasonable to suppose that very little blood enters or leaves the supratentorial cavity. It is, however, obvious that the medulla must be nourished and provided with oxygen. The arrangement of the dural septa is such as to protect the medulla from the severe conditions of pressure exerted on the supratentorial cavities. The compression of the baby in an ordinary head presentation prevents any descent of the medulla by providing an equal pressure from below. This normal mechanism persists until delivery of the head when an almost perfectly devised decompression occurs as the head is delivered. Breech extraction, even if unassisted, removes certain safeguards in the way of equalized pressure, and the breakdown of the mechanism is evidenced by the frequency with which tentorial tears are found.

Another peril that faces the child is the result of persistent delay. Obviously, edema and a resultant anoxemia may occur from this cause also. When interference is deemed advisable, it is obviously possible to work out a method of reenforcing physiologic forces of which forceps delivery is an example, or it is possible to impose an entirely new force, that of traction, as is done in breech extraction.

*Read, by invitation, at a meeting of the New York Obstetrical Society, December 10, 1930, in a Symposium on Resuscitation of the Newborn.

The neurologist, looking at obstetrics from a purely theoretical point of view, is impressed with the fact that most obstetric teachers do not seem to emphasize the fact that traction is completely unphysiologic. The mere fact that it is unphysiologic is, of course, of no importance, since practically all surgery is unphysiologic, in its nature. The only quarrel the neurologist has with the obstetrician is that he doubts whether he fully appreciates the nature of the material on which this unphysiologic force is imposed.

If this whole conception of labor is valid, it seems obvious that the obstetrician ought to watch labor as an experiment in control of intracranial and intraspinal mechanism as well as an experiment in forces acting upon an inert mass of tissue.

When the baby is once born, it is, of course, in the highest degree important to decide whether apnea, which may become alarming, is caused by disturbance of intracranial pressure, or whether it is the result of frank chemical causes. Obviously, if the child's intracranial and spinal contents are damaged, the most certain way of causing trouble is to produce further intracranial pressure. The traditional methods of performing artificial respiration should be reviewed with greatest rigidity. In the first place, if the baby has not taken a breath, compression of the trunk can only drive blood into the head. It cannot possibly favor the entrance of air into a collapsed lung. If, therefore, the medulla is inactive through trauma or through long-continued pressure, it seems in the highest degree illogical to handicap this region of the brain further by pumping in more blood. The whole question as to whether or not air actually gets into the lungs with various methods of artificial respiration is, of course, of cardinal importance. Quite clearly, no method that does not get air into the lungs will be effective no matter what the composition of the air is. From the purely experimental neurophysiologic point of view, the Drinker Respirator seems ideal. One of the things that has astonished and rather depressed certain neurologists is the degree of success by which physiologists maintain life in decerebrate animals in laboratories, and the rather prompt death of certain apneic infants.

Nobody is foolish enough to suppose that competent obstetrics can be performed by neurophysiologists. On the other hand, the carrying out of the principles of control of intracranial pressure, and the proper physiologic methods of resuscitation may be of the greatest assistance to the members of an harassed profession who are dealing, of course, with urgent cases.

(For discussion, see page 600.)

THE DRINKER RESPIRATOR TREATMENT OF THE IMMEDIATE ASPHYXIA OF THE NEWBORN*

With a Report of 35 Cases

By Douglas P. Murphy, M.D., Ross B. Wilson, M.D., and James E. Bowman, M.D., Philadelphia, Pa.

(From the Gynecean Hospital Institute of Gynecologic Research, University of Pennsylvania and the Philadelphia Lying-In Hospital)

RECENTLY Murphy and Coyne described the first use of a Drinker respirator in the treatment of 5 newborn infants suffering from a severe grade of asphyxia. Each infant finally developed normal rhythmic breathing during the treatment, and 2 of the 5 were discharged from the hospital alive, fourteen days after birth. From these observations, and from unpublished experimental data, the Drinker respirator was believed by them to offer the simplest, safest and most scientific method for treating asphyxia of the newborn. The present contribution deals with the same treatment of an additional group of 35 asphyxiated newborn infants.†

To quote from the previous article,[1] the principle upon which the Drinker respirator works is briefly as follows:

> "The patient is placed in a metal box or respirator with his head protruding from one end through a snugly fitting rubber collar. When the respirator is closed, the body is in a relatively air-tight container, with the head exposed to room air. By means of an electrically driven pump and valve arrangement, changes of air pressure are induced within the respirator. Thus, moderate degrees of accurately measured negative pressure are made to alternate rhythmically with atmospheric pressure. When negative pressure is applied, air at atmospheric pressure enters the respirator through the nose, mouth, and trachea; it is drawn into the lungs and the chest expands. When the negative pressure within the respirator returns to normal, the elastic recoil of the chest produces expiration."

A photograph of an infant size Drinker respirator is shown in Fig. 1, with a doll in the negative pressure chamber.

Absence of breathing in the newborn, as regards the time of its occurrence, can be studied conveniently under 2 headings, (1) when observed for the first time at birth, and (2) the acute respiratory failure which may not appear until some hours or even days after birth. The latter is usually seen in immature infants; the former is to be observed in mature infants as well as in immature ones. The present report concerns the treatment of immediate birth asphyxia.

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*Read before the New York Obstetrical Society, November 9, 1930.

†The infants were born in the Maternity Department of the University of Pennsylvania Hospital and in the Philadelphia Lying-In Hospital. The authors are very much indebted to Drs. Edmund B. Piper and Norris Vaux for the privilege of making the observations which form the basis for this report.

Records of 35 infants, treated by the Drinker method, form the basis for this report. They constitute 4.9 per cent of 709 consecutive live births, observed in 2 teaching maternity hospitals. Summaries of their records appear in Table I. The material is arranged in 2 parts; the first deals with infants which were alive at the last observation, i.e., when their mothers were discharged from the hospital. The second section includes the infants who died in the hospital while under observation. It will be noted that all of the infants were handicapped by reason of either the prenatal condition of the mother, the nature of the delivery or by immaturity. Hence they suffered from more than a simple lack of oxygen or excess of carbon dioxide, or both.

The only preparation for the mechanically induced artificial respiration, consisted of clearing the upper air passages of any obstructing

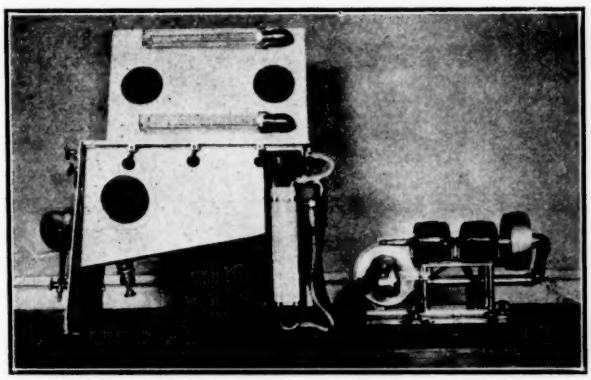

Fig. 1.—Photograph of infant size Drinker respirator with doll in the negative pressure chamber. The depth and rate of breathing are controlled by the motors shown on right, each controlled in turn by a rheostat. The depth and frequency of the pressure changes are recorded on the manometer seen in the center of the picture.

material. This was effected by holding the infant head down while aspirating the nasopharynx with a soft rubber catheter. During the artificial respiration period the aspiration was repeated as needed. As soon as the upper air passages were believed to be clear, the infant was placed in the respirator and treatment was begun. The latter was carried on with the infant tilted head down, at an angle of 15° to 20°, as shown in Fig. 1. The baby was either in the supine or prone position. Using the supine position, it was easier to observe the mechanically induced respiratory movements, and the cardiac impulse.

Table I shows summary of records of 35 asphyxiated newborn infants, treated in Drinker respirator. The first 21 infants were discharged from hospital alive, the last 14 died in the hospital. The latter are arranged according to the cause of death, as indicated by autopsy or by clinical findings.

TABLE I. RECORDS OF INFANTS TREATED IN DRINKER RESPIRATOR

SERIAL NUMBER	HOSPITAL NUMBER	PRENATAL DIFFICULTIES	DELIVERY	BIRTH WEIGHT		BREATHING ATTEMPTS BEFORE TREATMENT	TREATMENT STARTED; MINUTES AFTER BIRTH	FIRST SPONTANEOUS BREATH; MINUTES OF TREATMENT	FREQUENT RHYTHMIC BREATHING; MIN. OF TREATMENT	DURATION OF TREATMENT (MIN.)	DURATION OF OBSERVATION			CONDITION AT LAST OBSERVATION	CAUSE OF DEATH	METHOD OF DIAGNOSIS
				POUNDS	OUNCES						DAYS	HR.	MIN.			
1	7596 U	None	Cesarean section	5	5	3	8	?	?	?	29			Alive		
2	7646 U	Eclampsia	Cesarean section	3	6	3	?	12	28	28	23			Alive		
3	2476 L	Preeclampsia	Cesarean section	4	4	3	2	1	9	9	17			Alive		
4	2784 L	None	Cesarean section	4	11	Few	1	?	8	8	48			Alive		
5	7758 U	Preeclampsia	Breech	5	11	0	2	6	?	?	28			Alive		
6	7756 U	None	Breech	5	6	0	1	2½	5	6	12			Alive		
7	358M L	Placenta previa	Version	6	2	0	1	3	23	23	29			Alive		
8	7569 U	None	A-T forceps	7	3	0	1	?	15	15	13			Alive		
9	7764 U	None	High forceps	7	14	0	2	3½	4½	6	12			Alive		
10	7769 U	None	Midforceps	5	3	0	2	4	5	8	13			Alive		
11	7793 U	None	Midforceps	6	8	2	6	5	28	32	21			Alive		
12	2550 L	None	Midforceps	6	9	1	9	1	4	5	12			Alive		
13	2890 L	Preeclampsia	Midforceps	9	10	Few	1	4	7	7	16			Alive		
14	7772 U	None	Low forceps	6	3	?	5	4	9	11	13			Alive		
15	7857 U	None	Low forceps	6	3	2	1	5	14	14	13			Alive		
16	361 L	None	Low forceps	7	13	0	2	1	8	8	11			Alive		
17	2616 L	None	Low forceps	6	5	0	1	1	5	16	13			Alive		
18	392 L	Eclampsia	Low forceps	5	11	3	10	?	6	13	15			Alive		

TABLE I—CONT'D

SERIAL NUMBER	HOSPITAL NUMBER	PRENATAL DIFFICULTIES	DELIVERY	BIRTH WEIGHT		BREATHING ATTEMPTS BEFORE TREATMENT	TREATMENT STARTED; MINUTES AFTER BIRTH	FIRST SPONTANEOUS BREATH; MINUTES OF TREATMENT	FREQUENT RHYTHMIC BREATHING; MIN. OF TREATMENT	DURATION OF TREATMENT (MIN.)	DURATION OF OBSERVATION			CONDITION AT LAST OBSERVATION	CAUSE OF DEATH	METHOD OF DIAGNOSIS
				POUNDS	OUNCES						DAYS	HR.	MIN.			
19	2788 L	None	Low forceps	7	1	Few	11	½	17	20	11			Alive		
20	2790 L	None	Low forceps	6	10	Few	8	1½	10	10	14			Alive		
21	2868 L	None	Spontaneous	6	11	Few	5	2	10	10	12			Alive		
22	7579 U	None	A-T forceps	6	8	1	1	Few	0	120		2		Dead	Cerebral hemorrhage	Autopsy
23	7713 U	None	Low forceps	4	11	0	1	4	6	15			15	Dead	Cerebral hemorrhage	Autopsy
24	2803 L	None	Version and A-C head forceps	9	2	0	4	0	0	28		2		Dead	Cerebral hemorrhage	Autopsy
25	2919 L	None	Version	6	12	0	8	0	0	123		2	03	Dead	Cerebral hemorrhage	Autopsy
26	422M L	None	Midforceps	8	1	0	3	0	0	10			10	Dead	Cerebral hemorrhage	Clinical
27	2458 L	Preeclampsia	High forceps	8	5	Few	26	1	0	36			36	Dead	Cerebral hemorrhage	Clinical
28	7562 U	None	Spontaneous	2	6	1	15	6	?	65		1	05	Dead	Prematurity	Autopsy
29	3359 L	None	Version	3	8	Few	3	?	3	30		1	07	Dead	Prematurity	Autopsy
30	2349 L	None	Version	2	12	2	5	2	21	21		4	20	Dead	Prematurity	Autopsy
31	2657 L	Eclampsia	Cesarean section	2	9	Few	2	1	4	4	18	00	00	Dead	Prematurity	Autopsy
32	2550 L	None	Version	4	8	0	13	½	2	2	11	4	30	Dead	Prematurity	Clinical
33	2429 L	Eclampsia	Low forceps	4	10	Few	7	?	20	20		11	15	Dead	Prematurity	Clinical
34	2575 L	None	Spontaneous	?	?	0	?	?	0	71		1	37	Dead	Prematurity	Clinical
35	2898 L	None	Spontaneous	1	12	3	6	3½	33	443		8	54	Dead	Prematurity	Clinical

Abbreviations:
U = University Hospital.
L = Lying-In Hospital.
A-T = Axis-Traction Forceps.
A-C = After coming head forceps (Piper).
0 = Negative Findings.
? = Knowledge Inaccurate.

The prone position, however, with the head down and turned to the side gives opportunity for better drainage of the air passages. The respirator motors were adjusted to give a breathing rate of 45 per minute for one group of infants, and 35 per minute in another group. The negative pressure employed was sufficient to raise the column of water in the manometer (shown in the center of Fig. 1) from 8 to 10 cm. With these settings it was possible to secure an adequate degree of ventilation, as indicated by the number of infants who survived. Less than 8 cm. pressure has been found to be inadequate in maintaining artificial respiration in a certain percentage of cats paralyzed with curare. Though pressures above 10 cm. may be used in the treatment of cats or infants, if the upper air passages are clear of any obstructing plugs of mucus, etc., it is inadvisable to exceed this level very much in the treatment of infants at birth, since the condition of the air passages, at that time, cannot be ascertained.

In each case treatment was carried on until the infant developed a normally rapid rhythmic respiratory activity, or until no evidence of life existed. The latter was indicated by the changed color, and by auscultation of the cardiac area, after opening the respirator.

Only 3 of the 35 infants failed to breathe at all during their treatment. A few gave one or two gasps, but never developed a normally rapid rhythmic type of breathing. The breathing of the surviving infants developed in the following manner: A single spontaneous breath would appear during the course of treatment. This would consist of a short but weak gasp, associated with a spasm involving the head and neck muscles. It would be followed by similar breathing efforts, exhibiting an increasing frequency and vigor, until a point would be reached when the rate was rapid and steady. The respirator would then be stopped, since the infant would be breathing adequately for its needs. It had been observed in experimental studies upon animals, and in the treatment of other infants,[1] that the respirator was of little, if any value, when spontaneous breathing was fully established. When this had begun, the animal or infant totally ignored the influence of the machine, holding its breath at will, or breathing at an independent rate, as the case might be.

Essential data pertaining to the treated infants is recorded in Table I. It will be noted that the majority of the infants survived, in spite of the poor prenatal conditions of the mothers and the difficulties of the deliveries. It will be further observed that the surviving infants were those which were the more mature, as indicated by their birth weights.

Information upon the time interval between birth and the beginning of artificial respiration, and its relation to survival of the infant, is summarized in Table II. It will be noted here that the majority of the infants received their first treatment more than two minutes after

birth. While on the other hand those which received their treatment earlier, showed the largest number of survivors.

TABLE II. INTERVAL BETWEEN BIRTH AND TREATMENT

TIME IN MINUTES	NUMBER OF INFANTS	CONDITION AT LAST OBSERVATION	
		ALIVE	DEAD
Within 2	15	12	3
2- 5	6	2	4
5-10	8	5	3
10-	5	1	4
Totals	34	20	14

Table II shows a summary of data taken from Table I, dealing with the interval between birth and the start of Drinker respirator treatment of 34 infants. Note the decrease in the number of surviving infants, with the increase of the interval between birth and the beginning of treatment.

A glance at Table III indicates to a certain extent at least, the degree of asphyxia exhibited by the patients, as shown by their respiratory power during the period before treatment was instituted. Twenty-five of the 35 had taken three, or less than three breaths before being treated.

TABLE III. BREATHING ATTEMPTS BEFORE TREATMENT

BREATHS	NO. OF INFANTS
None	14
3 or less	11
Few (number not recorded)	10
Total	35

Summary of data taken from Table I, dealing with the respiratory power of the 35 treated infants, before Drinker respirator treatment was instituted. Note that 26 of the 35 infants breathed less than 4 times prior to the start of their treatment.

The time of the first spontaneous breath after the start of treatment was noted in 24 instances (Table IV). It will be observed that the majority of infants exhibited the first sign of spontaneous respiratory activity within the first four minutes of treatment, that one infant, which took no spontaneous breath for the first twelve minutes, finally breathed normally and survived.

Onset of rapid rhythmic breathing was studied in 32 infants. Of these, [illegible] breathed with normal rapidity. The interval between the start of treatment and the time of the rhythmic breathing of the remaining 26 is given in Table V. It will be seen from this table that 3 infants survived, though their normal breathing did not return until after twenty minutes of artificial respiration.

The infants were followed to the date of their discharge from the

TABLE IV. TIME OF FIRST SPONTANEOUS BREATH DURING TREATMENT

TIME IN MINUTES	NUMBER OF INFANTS	CONDITION AT LAST OBSERVATION	
		ALIVE	DEAD
Within 2	11	7	4
2-4	8	6	2
4-6	4	3	1
12	1	1	0
Totals	24	17	7

Summary of data taken from Table I, dealing with time of onset of first spontaneous breath to take place during treatment. Note that one infant survived, though it did not breathe spontaneously until twelve minutes of respirator treatment had been given.

TABLE V. ONSET OF RHYTHMIC (RAPID) BREATHING

TIME IN MINUTES	NUMBER OF INFANTS	CONDITION AT LAST OBSERVATION	
		ALIVE	DEAD
Within 5	8	5	3
5-10	9	8	1
10-20	4	3	1
20-30	4	3	1
30-35	1	0	1
Total	26	19	7

Summary of data from Table I, dealing with the time of onset of rapid rhythmic (normal) breathing of 25 infants treated in the Drinker respirator. Note that three infants survived, though they did not develop an adequate spontaneous respiratory activity until more than twenty minutes of respirator treatment had been given.

hospital. Of those which died, it will be noted in Table I, a number of them lived for several hours after birth, and two lived eleven and eighteen days respectively. It is evident from this, that the infants who survived for some time were suffering from injury other than simple asphyxia. When the respirator was effective in permitting spontaneous breathing to begin, and for this to be followed by a rapid rhythmic form of breathing, its function as an aid in the treatment of the asphyxia was then ended.

Of the infants who survived (21) it is quite impossible to say to what extent they were saved by the use of this method of treatment. It is firmly believed that certain of them at least, owed their lives to the treatment, and that no doubt others were saved from degrees of asphyxia which, though they would not have caused death, might have produced serious damage to vital tissues.

Of the infants who did not survive, death was believed to have resulted from two chief causes, (1) injury to the cranial contents, and as a result of (2) prematurity. (Table VI.) Of the 14 dead infants, 8 came to autopsy, which helped to confirm the diagnoses.

TABLE VI. DEATHS

CAUSE	NUMBER OF INFANTS	EVIDENCE	
		AUTOPSY	CLINICAL
A. Cerebral hemorrhage (Average weight, 7 pounds 3 ounces)	6	4	2
B. Prematurity (Weights)	8	4	4
1. 4 pounds 10 ounces			
2. 4 pounds 8 ounces			
3. 3 pounds 8 ounces			
4. 2 pounds 12 ounces			
5. 2 pounds 9 ounces			
6. 2 pounds 6 ounces			
7. 1 pound 12 ounces			
8. (No record)			

Summary of data taken from Table I, regarding the cause of death of 14 asphyxiated infants treated in the Drinker respirator. Note the decided immaturity of the infants diagnosed as having died as a result of immaturity (prematurity) contrasted with the average weight of those infants who died of cerebral hemorrhage.

COMMENT

It is evident that in maternity hospitals at least, asphyxia neonatorum is a major obstetric problem, in view of the high percentage of infants that exhibit this condition (approximately 5 per cent). It is also apparent that many asphyxiated infants, when properly cared for ultimately survive. The cause of the asphyxia, at the time of birth, cannot always be determined. Regardless of this, or of the degree of asphyxia, artificial respiration should be instituted, and be maintained as long as any evidence of life exists. It is presupposed, however, that the upper air passages have been cleared of all obstructive material before any form of artificial respiration is employed.

In the recent report by Murphy and Coyne,[1] one infant failed to exhibit a spontaneous breath until artificial respiration had been maintained continuously for one hour and four minutes. From this, and from other observations, it is believed that no commonly employed method of artificial respiration (including the Drinker method) actually incites the respiratory apparatus into activity in infants suffering from deep asphyxia, though it may act as a stimulant. The chief indication therefore is to maintain an adequate degree of pulmonary ventilation over a long period of time. It is possible that during this period the respiratory center may of its own accord begin to function, and to a degree sufficient for the needs of the organism.

If this theory is tenable, the Drinker respirator offers the best method of treating asphyxiated newborn infants, since by its use it is possible to maintain an adequate pulmonary ventilation for an indefinite period of time. Its advantages are the following: The principle of its action is sound. The negative pressure acts upon each square inch of the chest equally, without the application of undue

pressure at any single point. The machine has already reached a high degree of perfection, and the limits of safety of its use have been studied upon experimental animals. The machine can be so adjusted that the normal rate and depth of breathing of the newborn infant can be closely approximated, to insure adequate ventilation without at the same time producing symptoms of overventilation.

Treatment is available at an instant's notice, and may be carried on for an indefinite period, without effort on the part of the attendant, and with the minimum expenditure of energy on the part of the infant. If the latter is immature, and later respiratory failure is likely to occur, the infant can live in the machine so that treatment can be started at a second's notice. The negative pressure chamber is so built that the body can be maintained horizontally or head down. The latter position is the best during treatment, since it aids the gravity discharge of fluids from the upper air passages.

The infant can be maintained in surroundings of any temperature desired, above that of room temperature. At the same time its head is exposed to the cooler room temperature, which has a higher and therefore more desirable moisture content. Throughout the treatment the infant lies perfectly quiet, except for the movements of the chest wall induced by the machine, and is not subjected to any force that cannot be both controlled and measured. Nor is he subjected to the dangers of pulmonary infection, always a possible sequel of mouth-to-mouth insufflation.

In conclusion it may be said that the use of the Drinker respirator, in its clinical application to the treatment of asphyxia neonatorum, has passed the purely experimental stage of its development; that when employed, using the amount of negative pressure (8 to 10 cm.) and breathing rate (45 per minute) as herein advised, there need be no fear that any possible damage can result to the infant so treated. The apparatus is so simple of construction and of operation, that its operation can be readily understood by the average person, which fact gives it a very wide field of usefulness.

REFERENCE

(1) *Murphy, D. P., and Coyne, J. A.:* J. A. M. A. **95**: 335, 1930.

(For discussion, see page 599.)

THE TREATMENT OF POSTNATAL ASPHYXIA*

By Paluel J. Flagg, M.D., New York, N. Y.

ASPHYXIA is a generic term implying oxygen want.

The specific instances of asphyxia exhibited in foreign body obstruction, asphyxia neonatorum, drug poisoning, submersion, electric shock, and anesthetic accidents, all show a common sequence of signs and symptoms.

Asphyxiated patients, whether baby or adult, are readily grouped into three classes as follows:

In the first class, we find the depressed patient, the patient who may be roused, whose respiratory center, circulation, muscle tone, and reflexes while subnormal from anoxemia are readily stimulated and quickly resume their normal functions. These cases are by far the most numerous.

Second, we find the patient who cannot be roused, whose respiration is markedly affected, giving rise to varying degrees of cyanosis, whose circulation shows the effect of decreased ventilation, by reason of decreased rate and volume, whose muscle tone is reduced, and whose superficial reflexes are in abeyance.

And then we find the third class, the case of extreme asphyxia, the patient whose respiration has ceased altogether, whose circulation is failing, whose muscle tone and reflexes have entirely disappeared. It is upon this class that we, as physicians, should focus our best energies, for this is the patient who dies unless he be promptly and effectively stimulated with oxygen and carbon dioxide.

Of the specific instances of asphyxia which demand our attention, asphyxia neonatorum offers the most fertile field for the following reasons:

Preparation may be made in advance.

We meet our patient at once, without the delay, for example which usually occurs in submersion, gas poisoning, etc.

The vitality of the baby is much greater than the adult.

Owing to his size and easily approachable respiratory structures, he offers less resistance to treatment.

Finally, the very delicacy of the structure involved encourages and rewards painstaking and precise treatment.

The physiologic pathology involved in asphyxia, while intricate in its relations, follows, nevertheless, a definite sequence of mechanical events which render logical treatment comparatively simple. Pre-

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natal atelectasis plus asphyxia from any cause, such as anesthesia, cord pressure, central pressure, drugs, foreign body obstruction, etc., results in a high right heart pressure, low left heart pressure, open foramen ovale, reduced cerebral circulation, continued anoxemia, increased central pressure, and if unrelieved, a dead baby.

The indications are, therefore, to relieve at once prenatal atelectasis, and to prevent postnatal atelectasis arising from bronchial obstruction. The alveolar capillaries may then be readily oxygenated, decreasing the right heart pressure, increasing the left heart pressure which closes the foramen ovale, throws an increased circulation in the respiratory center, and in addition to oxygenating it, affords stimulation by the CO_2 which has been added to its normal gas content.

In the midst of these considerations, one is apt to pause and reflect, "I have done obstetrics for years, and I do not seem to run into these asphyxial difficulties." However, it is a generally accepted fact that out of every 100 babies born, 4 die regrettable deaths, and of these 4, at least 1 dies from the acute asphyxia under consideration.* Therefore, in every service of 100 cases a month, dating from this evening, ten to twelve babies are to die before next December 9. It is upon this group of doomed babies that we now fix our attention.

In view of what has been said, how may we best make use of available facilities to decrease the fetal mortality from asphyxia during the coming year?

First of all it is as important to grasp the actual degree of asphyxia present as it is to make a diagnosis and prognosis in a surgical abdomen, typhoid, or pneumonia. The immediate question to be asked and answered is, Into what class of asphyxia does this baby fall? Is he merely depressed, is he dying, or is he quite obviously a borderline case?

1. The depressed case, the baby who breathes occasionally in gasps, who moves about when stimulated, who empties his bladder, who resists movements of his head and his extremities, usually responds to any form of stimulation. He responds successfully to resuscitation

*The Bureau of Vital Statistics of the New York Board of Health furnished the following figures for the year 1929 in stillbirths:

Total population for the five boroughs	6,881,882
Total number of births recorded	124,404
Total number of stillborn	5,726

Of this total of 5,726,
535 due to cord pressure
164 due to breech
111 due to malposition
184 due to deformed pelvis
354 ascribed to difficult labor
265 due to asphyxia,
giving a total of 2,013.

For the sake of a conservative estimate, we might reduce this figure by 30 per cent, giving us a total of approximately 1,200 deaths for approximately 120,000 births, or 1 per cent.

This 1 per cent fetal mortality at birth does not include the neonatal deaths directly due to atelectasis, antenatal and postnatal, and to postnatal pneumonia, and pulmonary complications due to aspiration.

by the spanking, tubbing technic. He will promptly and vigorously respond to inhalations of oxygen CO_2 offered to him by a pharyngeal tube or a small mask applied over his face. Such babies, so stimulated, promptly reach a stage of crying and struggling which overcomes their atelectasis through automatic, intratracheal pressure against the closed glottis. Every case of depression, however, should receive the benefit of pharyngeal suction, for all efforts to increase the depth of the respiration by pharyngeal tube or inhaler, in the presence of fluid in the pharynx is a direct means of inducing aspiration and postoperative pneumonia, as well as postoperative atelectasis and bronchiectasis.

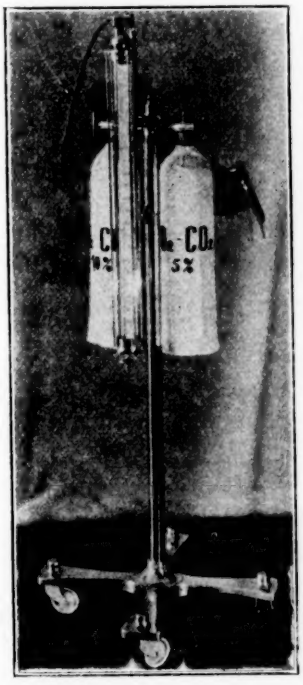

Fig. 1.—Resuscitation apparatus (Flagg), hospital model.

2. The asphyxiated baby whose respiration occurs at long intervals and only following external stimulation, whose muscles are relaxed, who offers no resistance to the opening of the mouth, should be immediately laryngoscoped, and the pharynx aspirated.

If there is no reflex irritation induced by this aspiration, the glottis should be intubated with the suction tube under direct vision and the trachea aspirated.

The reflex tone of the glottis is the best indication of the child's viability. If the reflex is active, he will promptly respond to oxygen CO_2. If there is no reflex spasm of the glottis, the baby falls into the third class of asphyxia. He is dying.

3. Such a baby demands immediate and full oxygenation and the stimulating effects of CO_2. As we observe such an infant and see the lividity or the pallor of the skin, the total absence of respiration, the flicker of a heart impulse through the chest wall, the complete loss of muscle tone, it is easy to understand the necessity for prompt, vigorous action. The upper portion of the respiratory tract from the lips to the vocal cords has become a collapsed flabby tube containing more or less fluid. Ordinary physics demands that this tube be opened, that fluid be removed, and that a patent gas channel which will reach past

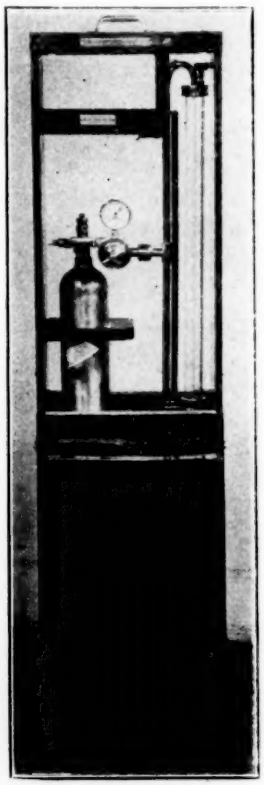

Fig. 2.—Resuscitation apparatus, portable model.

obstruction into the trachea be promptly introduced. Through such a tube, oxygen CO_2 may be delivered under measured pressure. Such pressure overcomes atelectasis, allows of an immediate diffusion and absorption of oxygen CO_2 which relieves the right heart pressure, increases the left heart circulation, and throws the necessary stimulation into the depressed respiratory center.

The treatment of postnatal asphyxia may be summed up as follows: The actual condition of the baby is the guide to the treatment which he requires. The actual condition of the baby is measured by his muscle tone and reflexes.

Every baby, without exception, is entitled to an immediate postoperative toilet which includes suction of the mouth and pharynx. This treatment alone will play a definite part in preventing postoperative pulmonary complications due to aspiration.

If muscle tone and reflexes permit of easy laryngoscopy, this should be done at once and the pharynx and the larynx inspected.

Should the baby offer no resistance to this procedure, the larynx should be intubated and aspirated.

If the glottic reflex is reduced or abolished by the anoxemia present, the insufflation tube should be introduced and intratracheal insufflation of oxygen CO_2 under pressure of 15 to 20 mm. of mercury, seven-and-a-half to ten inches of water should be promptly carried out. This treatment should be continued until respiration is reestablished, or, in the absence of a reestablished respiration, until the heart has ceased to beat and cyanosis develops in the face of this intratracheal oxygen insufflation, indicating the final failure of the circulation.

In conclusion, I believe that the treatment of postnatal asphyxia implies first of all, recognition of the degree of asphyxia, aspiration, laryngoscopy, intratracheal suction, intratracheal insufflation of oxygen CO_2, under measured pressure with the continuation of insufflation, until respiration is reestablished, or until the circulation is proved to have failed, as evidenced by the persistence of cyanosis in the presence of a high percentage of oxygen in the alveolar air.

The technic described is designed to meet every type of asphyxia with the utmost directness and simplicity.

In view of the practical success of this technic in the wide field of asphyxias, one may with safety predict that before long every hospital organization will find it necessary to add to its existing department, the department of gas therapy, whose field shall include the scientific resuscitation of infant and adult, oxygen therapy, as now widely employed, and finally the supervision and the administration of inhalation anesthetics.

189 East Sixty-Fourth Street.

(For discussion, see page 600.)

THE INHALATIONAL METHOD OF RESUSCITATION FROM ASPHYXIA OF THE NEWBORN*

By Yandell Henderson, Ph.D., New Haven, Conn.
(From Yale University)

THE object of the inhalational method is much broader than mere resuscitation from asphyxia at birth. It aims to insure that the child shall not only be alive at birth, or alive the next day, but also alive at the end of the neonatal period of three or four weeks. More deaths now occur in the neonatal period than the total of stillbirths. More lives can be saved from the secondary effects of incomplete dilatation of the lungs in the neonatal period than from primary birth asphyxia.

The inhalational treatment of asphyxia has therefore two aspects: (a) It is the sole and only really effective method of resuscitation from primary asphyxia at birth that nature and science afford. It can save many lives now lost at birth. (b) In addition it can achieve a far larger saving of life from among those who now die in the neonatal period.

The large majority of the babies that breathe spontaneously nevertheless retain for hours or days or even for weeks undilated areas in their lungs. From this condition of unrelieved atelectasis result secondary asphyxia and neonatal pneumonia. Cruickshank's observations in Scotland, as well as those of Wasson in this country and von Reuss in Germany, demonstrate that pneumonia consequent upon atelectasis causes two-thirds of all the deaths in the neonatal period, nearly as many in fact as the total of stillbirths.

For the nonbreathing newborn child I favor the simplest apparatus: A small cylinder of a mixture of oxygen and 7 per cent carbon dioxide, a mask to enclose the face, and a rubber bag of only 2 or 3 liters capacity with a valve or stopcock at the end. The bag is filled and the cylinder shut off. The mask is held on the face while the bag is squeezed to make a gentle pressure sufficient to cause a succession of slight dilatations of the child's lungs. Then as spontaneous breathing begins the inhalation is continued. Or, if desired, mouth to mouth dilatation may be used and then the inhalation administered.

It is the inhalation and its stimulating effects upon natural breathing rather than any form of artificial respiration that is most important.

*Read (by invitation) at a meeting of the New York Obstetrical Society, held December 9, 1930.

This inhalation should be given several times a day for five or ten minutes for several days. It should be administered, not only to the asphyxiated, but to all normal children as well. The object is to insure full dilatation of the lungs. When this inhalation is universally adopted, instead of the ancient practice of making the child cry, the vast number of children that now die of pneumonia consequent upon continuing atelectasis during the neonatal period will be saved, in addition to those that can be resuscitated most effectively in this way from primary birth asphyxia.

The essential point regarding birth asphyxia is that, as a result of diminished blood supply to the brain during prolonged labor, the sensitivity of the respiratory center is depressed. In the normal child the respiratory center is stimulated, as soon as the placental circulation slows down, by the carbon dioxide formed in the child's own body. In the asphyxiated child, although there may be more carbon dioxide than normally, the center is so depressed that this stimulus is insufficient to excite natural breathing. But when a sufficient percentage of carbon dioxide is administered to the lungs, the center responds quite normally.

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(For discussion, see page 600.)

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Dietetic regulation, sufficient and graduated exercise, exposure of body to sunlight and sufficient bathing are important to prevent lowered resistance to puerperal infection. Foci of infection should be eradicated. The author cites 4 patients with focal infection who developed puerperal infection, one of whom died.

HIEMSTRA.

HEMANGIO-ENDOTHELIOMA INTRAVASCULARE OF THE OVARY*

A Review of the Literature With a Report of a Case

By Francis W. Sovak, M.D., F.A.C.S., and Victor Carabba, M.D.,
New York, N. Y.

(From the Gynecological Department of the University and Bellevue Medical College, and Pathological Department of Bellevue Hospital)

HEMANGIO-ENDOTHELIOMA intravasculare of the ovary is a very rare neoplastic disease. An extensive review reveals only four cases reported in all the literature. The case herein described represents the fifth and only case in American medical annals.

There have been reported 52 cases of ovarian endothelioma in general, all of them by continental observers. One case classified as angiosarcoma ovarii, published by Cullen in the Johns Hopkins Hospital Reports, is of questionable nature, probably of perithelial origin. The foreign cases reported were classified according to Borst's classification; namely, hemangio-endothelioma, intravascular and perivascular, and lymphangio-endothelioma. Thirty-two of the cases were lymphangio-endotheliomas arising from the lymphatic system and lymphatic spaces; 4 were cases of hemangio-endothelioma intravasculare, 2 arising from the blood capillaries and 2 from the blood vessels; 14 were cases of hemangio-endothelioma of the perivascular type, 12 of which arose from the endothelium of perivascular lymph spaces and 2 from the adventitial cells; 2 cases were metastatic from endothelioma elsewhere.

In spite of the seemingly common occurrence of this tumor variety in general, opinions of pathologists differed as to whether the endotheliomas should be considered as belonging to the group of sarcomas or to that of the carcinomas (epithelial growths). Kubo, after studying the work of Virchow, Volleman, and C. Hertwig (mesenchymal theory), came to the conclusion that there is no doubt that the fully differentiated endothelium is much more closely related to connective tissue than to epithelium, especially so as there often occurs normally transition from endothelial cells to true connective tissue cells, whereas no such occurrence is observed even in pathologic growths of epithelium.

REVIEW OF LITERATURE

In 1864, v. Recklinghausen reported a tumor extirpated from the orbit as having arisen from the endothelial lining of the lymphatics. Since then, 52 cases have been reported in the literature of tumors arising from the lymphatic and

*Read before the New York Obstetrical Society, November 11, 1930.

peri- and intra-vascular systems of the ovary. Leopold,[2] in 1874, was the first to prove extensive growth of endothelial elements in ovarian tumors and described a very large growth which he derived from the endothelium of lymph vessels.

In 1879, Marchand[3] published an interesting paper in which he stated for the first time and with absolute certainty that his patient had a tumor growth of endothelial nature in the ovary. He concluded, first, that it was a cystic papillary tumor of the ovary derived from the endothelium of lymphatics; second, a cystic tubular tumor of the ovary of endothelial origin and, third, that the tumors of endothelial origin must be differentiated from sarcomas. Flaischlen[4] was the next one to report about sarcomatous degeneration of ovarian cysts, the microscopic picture being the same as that of Marchand's tumors. Flaischlen concluded that it was a malignant degeneration of a cystic tumor of connective tissue origin, combined with a dermoid cyst. Olshausen and Ackermann,[5] and Eickardt,[6] in 1899, showed a definite relation of the tumor cells to the endothelium of blood vessels, and described their tumors as endothelioma intravasculare. Eickardt[6] was also the first to prove the ability of such a tumor to metastasize. Mary Dixon Jones,[21] in 1899, described twelve cases of "endothelioma" of the ovary from a clinical viewpoint. None of these could be regarded as endothelioma, however, and they were probably carcinomas or sarcomas, while others were not true newgrowths (Kubo).[18] Pomorski,[7] in 1890, was the first to diagnose these tumors as endothelioma lymphaticum, although Marchand had previously stated the possibility of such origin. V. Velits[7] described a tumor which, on account of the microscopic findings, he classified as being derived from the endothelium of the lymph vessels. V. Rosthorn,[8] in 1891, described such a tumor as endothelioma perivasculare of the ovary, there being evidently immediate relations between the newgrowth and the blood vessels. J. A. Amann,[20] in 1894, in a study of five cases of endothelioma, concluded that these growths originated from the endothelium of the blood capillaries and the endothelium of the lymphatics and tissue spaces. Thus, Amann and L. Pick[9] give recognition to several types of endothelioma, depending on the structures from which they arise, such as lymphatic and vascular endothelium and perithelium. In the years 1895-1899, several papers were written about these tumors by Voigts, Herz, and others. Linck, in 1900, described a case of bilateral endothelioma lymphaticum cystomatosum. He reviewed the literature to date and was inclined to conclude that his case was a metastatic one from a gastric neoplasm. Haacke, in 1901, described an endothelioma of the ovary of lymphatic origin, and described some syncytial masses the origin of which was not given. Schlagenhaufer[10] (1902), Polano[11] (1904), Papaioannou[12] and others pointed out the close resemblance of metastatic ovarian carcinoma to endothelioma and fibrosarcoma. Papaioannou,[12, 18] in 1904, as a result of his observations on the prevalent views, classification and histogenesis of endotheliomas of the ovary, reported as follows:

1. Perithelioma, in the sense indicated by Amann, represents an independent tumor which belongs among sarcomas and which is derived histogenetically from the adventitial cells of precapillary blood vessels.

2. The tumors described as endothelioma cannot be regarded as carcinomas.

3. A great number of independent endotheliomas of both ovaries may be carcinomatous metastases from abdominal organs. Thus, grave doubts arose as to the existence of any genuine endothelioma of the ovary. R. Meyer[13] was disposed to discard the entire group, and Ribbert[14] (1912) states the extreme view that the endothelial origin of any ovarian tumor, while possible, is unproved. Ewing[1] states that the most conclusive features of certain endotheliomas is the relation of cell groups, inclosing blood masses, as in angioblastic sarcoma. While the teratomatous nature of these tumors cannot be disregarded (Wlassow),[1] still Sternberg and Monckberg[15] and Pfannenstiel[19] endeavor to establish and recognize such tumors in the ovary. Ewing[1] thus states that, while critical research fully justifies

the current scepticism regarding the endothelial nature of the endothelioma, so called, there is nevertheless a restricted group of ovarian tumors for which very strong evidence points to an endothelial origin. The evidence, besides a histologic one, is the peculiar clinical course and gross appearance. The macroscopic behavior of the tumors is very variable. At times they are solid, at times cystic, and at other times combined with different ovarian growths. It is very difficult to differentiate them macroscopically from sarcomas or carcinomas. While Olshausen[5] described them as rare ovarian cystic tumors, Pick[9] did not think that the cyst formation was characteristic of them and that they did not differ roughly anatomically from the solid sarcomas and carcinomas of the ovary.

The above reported cases show the following characteristics:

Type.—Thirty cases (57.6 per cent) were solid tumors, with some mixtures of small cysts which had a honeycombed appearance and were located in the brittle spongy tumor masses. They also showed hemorrhagic, necrotic, and often unilocular, multilocular and combination cysts.

Age Incidence.—The age incidence also shows a very variable picture, the youngest patient being seven years old, the oldest sixty-four. Altogether there were 2 patients less than ten years of age, 4 between eleven and twenty, 10 between twenty-one and thirty years, 8 between thirty-one and forty years, 14 cases between forty-one and fifty years, 9 between fifty-one and sixty years, and 3 cases above sixty. The fourth decade is the most favorable, although there is no marked disposition to be noticed from the above figures.

Location.—Twenty-five cases involved the right ovary, 21 the left, 5 were bilaterally advanced, and in 1 case the primary seat was not mentioned. In 1 case the formation was traced nine years back and in others only a little over a half year had elapsed.

Symptoms.—There are no specific pathognomonic symptoms. At times there are pain, pressure, ascites, and atypical formation of the genitals, but they cannot be used as clinical signs of surety. Malignancy is present, but not so marked as in carcinomas and sarcomas.

Metastasis.—Local and general metastases take place by blood and lymph vessels, but at times through implantation, so that the primary growth is sometimes difficult to locate. Frequently there are adhesions to neighboring organs; e.g., to the pelvic wall, intestinal loops, etc. No patients with bilateral tumors (Kubo[18]) have been reported as recovered, but unilateral tumors have been successfully eradicated by several operators (Pfannenstiel).

Pathology.—Microscopically,[1] Kubo's[18] cases showed the tumor cells surrounding vascular channels which possessed a defined wall of normal endothelial cells, giving the structure of perithelioma. The tumor cells strongly indicate their endothelial nature. They are very uniform, small in size, cuboidal or rounded in form, pale-staining cytoplasm, and regular oval nuclei, with minute nucleoli. Mucinous and hyaline changes in these neoplasms are common.

CASE REPORT

E. W., colored, aged thirty-five, was admitted to Bellevue Hospital February 5, 1925, complaining of marked pain and swelling of the abdomen. One week previous to admission, the patient developed a dull pain in the lower right abdomen. After a day in bed, the pain disappeared and she was able to be about. Three days later, while at work, she was seized with sharp pains in the lower abdomen: the pains were both cramp-like in character and continuous. She stated that about one year previously she noticed a swelling of the abdomen, which had increased considerably during the week preceding the onset of pain. The family, medical,

and surgical history were irrelevant. Menstruation was established at fourteen years, was of the 28-day type and of four days' duration; there was no pre-, co- or post-menstrual pain. A period of amenorrhea occurred from 1917 to 1923, the cause of which was unknown. From 1923, the periods were irregular, appearing every six to eight weeks and lasting from two to ten days. The last regular period was on January 24, 1925, lasting seven days. The patient was delivered of one child eleven years previously, labor and puerperium being normal: no history of abortion.

On admission, the patient appeared to be acutely ill and physical examination disclosed a markedly distended abdomen. A midline tumor, extending 4 cm. above the umbilicus, was readily palpable. It was tense, regular in outline and tender; the greater part of it occupied the right half of the abdomen. Vaginal examina-

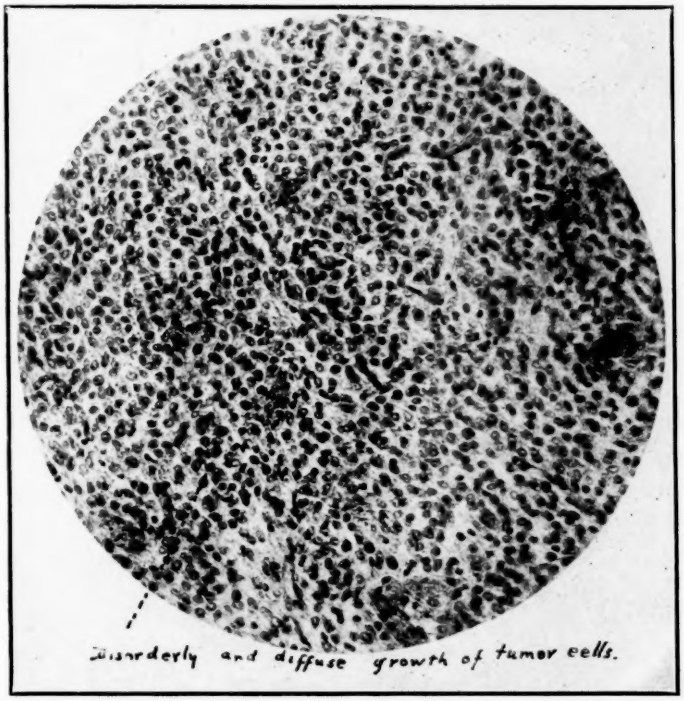

Fig. 1.—Disorderly and diffuse growth of tumor cells with practical absence of blood vessels.

tion showed a good parous pelvic floor. The cervix which was soft and slightly patulous, was in the axis of the vagina. The fundus was apparently posterior and its size could not be made out. The mass seemed to occupy the right abdominal cavity and extended slightly to the left, lying anteriorly to the uterus. It was partially movable. No definite pathologic condition of the adnexal could be detected by palpation. On rectal examination, the uterus was found retroverted and small, with the large tumor in front.

Temperature on admission was 101° F., pulse 120, respiration 22. Urine showed a trace of albumin, few hyaline casts; and many pus cells. Blood count showed leucocytes 12,000, polymorphonuclears 90 per cent, lymphocytes 10 per cent. Wassermann test was negative. Blood pressure was 100/60.

A provisional diagnosis was made of ovarian cystoma with a twisted pedicle, possibly infected.

Operation.—Operation was performed February 6, 1925, and disclosed a large ovarian cyst, arising from the right side, about 16 to 18 cm. in diameter, with a large rupture of its anterior surface, about 10 cm. long, through which old blood clot protruded. There was a complete double twist of the pedicle. The right tube was adherent to the mass. The peritoneal cavity contained about 1500 c.c. of thin serosanguineous fluid, but there was no evidence of peritonitis or of infection. The uterus and left tube were normal. The left ovary was small, presenting an old peri-oophoritis, with a thickened tunica. The cyst had a spongy feel, as if it contained clotted blood.

A right salpingo-oophorectomy was performed in the usual manner and the serosanguineous fluid drawn off. A two-point suspension was performed on the retro-

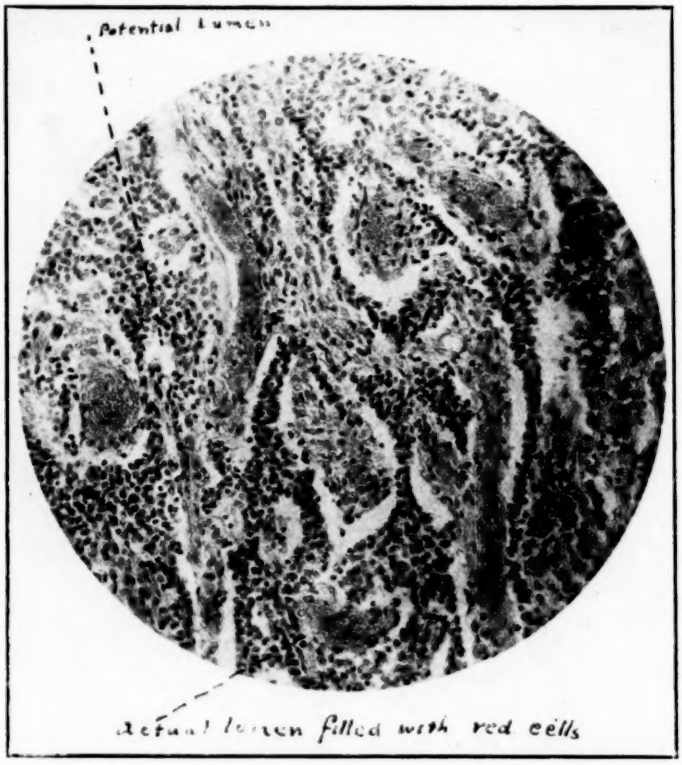

Fig. 2.—Shows the formation by the tumor cells of potential lumina and actual lumina crowded by red blood cells.

verted uterus. A clysis of 1000 c.c. of normal saline solution was given at the time of operation. Postoperative course was normal and the patient was discharged sixteen days later.

Pathologic Report.—Specimen consists of a large, globular, multilocular, cystic but firm mass, measuring 20 cm. in diameter, on one surface of which is an apparently normal appearing uterine tube. The serosa of the mass is glistening, deeply injected and hemorrhagic. The mass is filled with clotted blood and the inner lining is thrown into folds, dividing the tumor into several small and large divisions (lobulation). The lining membrane of the spongy, brittle tumor mass is smooth and glistening. The clots are easily separated from the lining. There is no evidence of the presence of any corpora lutea or graffian follicles. Thus,

while at operation the mass appeared to be an ovarian cystoma with twisted pedicle and secondary hemorrhagic changes, it later was found to represent the transformation of the entire ovary into a vascular neoplasm.

Microscopic Description.—(By Dr. Douglas Symmers, Director of Laboratories, Bellevue Hospital.) The histology of the tumor is complex. The cellular unit consists of a rather small rounded cell with a small amount of pinkish staining cytoplasm and a relatively large, rounded but poorly chromatic neucleus. When subjected to reciprocal pressure, these cells assume a short spindle- or oat-shaped form. In places, the tumor cells grow diffusely without any attempt whatsoever at orderly formation. In such areas blood vessels may be practically absent, while in other such areas, among the diffusely growing cells, are to be made out striking numbers of thin-walled blood vessels, lined by flattened cells, evidently derived directly from those of the tumor itself; the vessels being crowded by red blood corpuscles. In still other parts, the growth is provided with a richly cellular, rather mature connective tissue stroma, imbedded in which are numbers of long, narrow cellular islands, most of them composed of cells which are arranged in parallel rows and, of these, considerable numbers appear to be around a potential lumen, while others form the external limits to actual lumina. In still other instances, the lumen goes on to a considerable degree of dilatation and shows the presence in it of red blood corpuscles.

Return Clinic Note.—The patient was seen on November 26, 1926, twenty-one months postoperative and appeared to be in perfect health. She reported that she was delivered of a normal child on December 21, 1925 and, at the time of her visit, was five months pregnant. Gynecologic examination revealed a five months pregnant uterus; the left ovary was not palpable. The general physical examination was negative.

CONCLUSIONS

1. Hemangio-endothelioma intravasculare of the ovary is a rare pathologic entity, only 5 cases, including the present one, being reported in the literature.

2. Endotheliomas of the ovary have a definite histologic picture.

3. Endotheliomas of the ovary, although not as malignant as sarcoma or carcinoma, behave, in general, like these malignant neoplasms.

4. Endotheliomas of the ovary cannot be differentiated clinically from sarcoma or carcinoma of the ovary or from other newgrowths of the ovary.

5. Although bilateral endotheliomas offer a poor prognosis as to cure, unilateral endotheliomas can be successfully treated surgically. (Pfannenstiel and authors' case.)

We wish to thank Dr. Douglas Symmers, Director of Laboratories Bellevue Hospital, for his advice and help in the preparation of this paper.

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(For discussion, see page 597.)

A REVIEW OF THE TREATMENT OF THE CASES OF PLACENTA PREVIA AT THE BROOKLYN HOSPITAL FOR THE PAST TEN YEARS.*

By William F. Nelms, M.D., Brooklyn, N. Y.

OUT of 9,000 obstetric admissions to the Brooklyn Hospital for the years 1920 to 1929 (inclusive), there were 44 cases of placenta previa, an incidence of one-half of one per cent. Of this number 19 were primiparae and 25 were multiparae. The types were represented as follows: marginal 26; lateral 8; central 10. Eighteen or 41 per cent of the cases were premature.

All of these patients gave a history of painless bleeding at some time before admission, with the exception of two. All were definitely diagnosed as placenta previa by direct manual examination after admission.

Table I. Incidence. 1920-1929 (Inclusive)

	PRIVATE	WARD	TOTAL	PER CENT
Deliveries			9,000	
Previas	24	20	44	½
Marginal	16	10	26	59
Lateral	6	2	8	18
Central	2	8	10	23
Primiparae	10	9	19	43
Multiparae	14	11	25	57
Prematures	10	8	18	41

There were four maternal deaths out of the series, giving a maternal mortality of 9 per cent. The fetal deaths numbered 30, or 68 per cent. Of these 16 were premature, giving a corrected fetal mortality of 32 per cent. Sixteen of the mothers had a temperature of 100.5° or over, for forty-eight hours or more after delivery, giving a morbidity of 31 per cent.

*Read at a meeting of the Brooklyn Gynecological Society, October 3, 1930.

TABLE II. MORTALITY

	PRIMIPARAE	MULTIPARAE	TOTAL	PER CENT
Maternal	1	3	4	9
Fetal	12	18	30	68
Morbidity	5	9	14	31

As to treatment, each case was handled in one of the following five ways:

1. By rupturing the membranes to control the bleeding and allowing labor to progress normally, terminating spontaneously or by forceps extraction.
2. By internal podalic version and immediate extraction.
3. By Braxton-Hicks' version and spontaneous delivery, or breech extraction later.
4. By cesarean section.
5. In one case by the introduction of a number 4 bag and low forceps extraction after the head had descended following expulsion of the bag. In this case the mother recovered, but the baby died.

A total of 15 cases were treated by the first method (see Table III). There were no maternal deaths, and all of the six fetal deaths were premature babies. Two of the patients, or 13 per cent, had a reportable temperature. All cases were of the marginal type of placenta previa.

TABLE III. TREATMENT BY RUPTURING MEMBRANES

	PRIMIPARAE	MULTIPARAE	TOTAL	PER CENT
Total cases	7	8	15	34
Maternal mortality	0	0	None	None
Fetal mortality	2	4	6	40
Maternal morbidity	1	1	2	13
Prematures	4	4	8	53
Marginal type	7	8	15	100

Seven cases were treated by the second method. The cervix was found to be almost fully dilated on admission in two of these. Three cases were packed until the cervix was over four fingers open before performing the version and extraction. In one case the cervix was dilated by the use of a bag and in the other this was done manually. (See Table IV.) There were two maternal and five fetal deaths by this method.

Of the maternal deaths the first was a para iii about eight months pregnant, who was sent into the emergency ward by an outside doctor, with a history of bleeding intermittently for the previous three weeks, and very profusely just before admission. On examination the cervix was one finger dilated. There was very little bleeding from the examination. A central placenta previa was felt. She was packed, with no bleeding through the pack. The next morning the cervix was fully dilated, and a podalic version and extraction through the placenta was done with very little blood loss. The patient died shortly after delivery during a saline infusion. The cause of death was attributed to shock.

The second case was a para iii, full term, admitted to the emergency ward with a history of slight bleeding for five days before admission. She had been examined

and packed vaginally by a doctor in her home. A central previa was palpated on removing the pack, and the cervix found almost fully dilated. A version was then done through the placenta, and a dead fetus was extracted. The uterus was held bimanually during the repair, and the vagina then packed with dry gauze. The pack was removed on the second day postpartum. On the third day the temperature was 102° and pulse 100. For the following eight days the patient ran a septic fever and died of puerperal sepsis. Anerobic blood cultures were positive for B. welchi.

TABLE IV. PODALIC VERSION. IMMEDIATE EXTRACTION

	PRIMIPARAE	MULTIPARAE	TOTAL	PER CENT
Total cases	2	5	7	15
Maternal mortality	0	2	2	28
Fetal mortality	2	3	5	71
Maternal morbidity	0	3	3	42
Prematures	0	1	1	14
Marginal type	0	2	2	28
Lateral type	2	0	2	28
Central type	0	3	3	42

There were sixteen cases treated by the third method. In all but five the cervix was open sufficiently to perform the version and pull down a foot. In the remaining five the vagina was packed until the cervix was open enough for this. (See Table V.) The fetal mortality by this method was 100 per cent; the maternal morbidity 37 per cent. Six of the cases were premature. There were two maternal deaths.

TABLE V. BRAXTON HICKS WITHOUT IMMEDIATE EXTRACTION

	PRIMIPARAE	MULTIPARAE	TOTAL	PER CENT
Total cases	7	9	16	36
Maternal mortality	1	1	2	12
Fetal mortality	6	10	16	100
Maternal morbidity	3	3	6	37
Prematures	2	4	6	37
Marginal type	2	2	4	25
Lateral type	3	2	5	31
Central type	2	5	7	43

The first was a private case, para xiii, sent in from the outside, who was in desperate condition from loss of blood. The membranes were immediately ruptured and a foot brought down after version. The patient died on the table during a transfusion. The baby was not delivered. The second case was a para ix, admitted to the ward with a history of slight bleeding for two days before admission. Examination revealed a central placenta previa. She was packed vaginally while an anesthetic was being started, and then a podalic version performed through the placenta and a foot brought down. Breech delivery was done later. The patient had a profuse postpartum hemorrhage and was quickly packed in the vagina. The hemorrhage appeared to have stopped. She was given pituitrin and put to bed. About one hour later she was bleeding profusely through the pack and more packing was introduced. Later the pack was found partially expelled and the patient bleeding profusely. She was repacked by vagina, and died one hour later.

Cesarean section was done in five cases. (See Table VI.) Two of these were ward cases in which an hysterotomy was done at four to five months. There was no maternal mortality. The only fetal deaths were the two premature hysterotomy cases. Maternal morbidity was 60 per cent. Classical cesarean section was done in two cases and the low operation in one.

TABLE VI. CESAREAN SECTION

	PRIMIPARAE	MULTIPARAE	TOTAL	PER CENT
Total cases	3	2	5	11
Maternal mortality	0	0	0	None
Fetal mortality	1	1	2	40
Maternal morbidity	1	2	3	60
Prematures	1	1	2	40
Marginal type	3	2	5	100
Classical cesarean	1	1	2	40
Low cesarean	1	0	1	20
Hysterotomy	1	1	2	40

From Table III it would appear that most marginal previas may be satisfactorily treated by rupturing the membranes to control bleeding and allowing labor to progress normally with a good chance of saving the baby.

In the other types the plan of treatment would depend upon several factors, as the amount of blood loss before admission, the amount of bleeding upon admission, the period of gestation, the condition of the fetal heart, and general condition of the cervix as to dilatation, obliteration and rigidity. We feel that podalic version through the placenta, with the pulling down of a foot to control hemorrhage, is safer than attempting immediate breech extraction after version. By the former method our mortality was 12 per cent and by the latter 28 per cent. There is no hope for the baby by this method.

Douglas and Siegel[1] of the University of Maryland Hospital report a series of cases in which they state that their rule is to empty the uterus at once. In 34 cases they performed version and immediate extraction with four maternal deaths or a mortality of 11.11 per cent and a fetal mortality of 61.11 per cent. The maternal causes of death were rupture of the uterus, shock, lacerations of the uterus and infection. After delivery they always pack the uterus.

As for cesarean section, our figures are too small for conclusions to be drawn from them. The policy at this hospital has been to consider the more conservative methods safer for the mother, and in the cases of lateral or central placenta previa with considerable hemorrhage to more or less disregard the baby.

In the recent literature, however, there are many writers who think that cesarean section is the best treatment for all types of placenta previa, claiming that it is a quicker and surer means of controlling hemorrhage, emptying the uterus, preventing postpartum hemorrhage, and at the same time saving the baby.

Douglas and Siegel[1] report 14 cesarean sections in their series, with no maternal mortality, but their fetal mortality was 90 per cent.

Greenhill[2] at the Chicago Lying-In Hospital gives the total maternal mortality in 118 cases treated by the so-called older methods as 2.6 per cent. In 42 cases in which cesarean section was done there were no maternal deaths. He advocates low cesarean section in all cases of lateral or central previa, with or without several hemorrhages and regardless of the condition of the child, claiming that by low cesarean section the lower uterine segment, where most of the postpartum bleeding occurs, can be carefully inspected and torn sinuses controlled by sutures. He states that in the past nine years about half the monsters found have been associated with placenta previa, but that he believes cesarean section should be done in these cases in the interest of the mother. He does not give figures for fetal mortality.

Kellogg[3] of Boston believes that all patients with central or partial previa should be treated by abdominal section, whether the baby is viable or nonviable, living or dead.

Bill[4] reports a series of 45 cases in which cesarean section and transfusion were not very frequent. The maternal mortality was 11.1 per cent. In another series of 56 cases in which 71 per cent were delivered by cesarean section he states that there was only one death or 1.7 per cent.

Essen-Moeller[5] of Sweden reports 20 cases of abdominal section with a dead fetus before operation in three cases. The one death was caused by embolism.

Korthauer[6] reports a maternal mortality of 50 per cent by version and extraction, 11.1 per cent by Braxton-Hicks' version and 6.9 per cent by cesarean section.

A few of the European writers advocate vaginal cesarean sections. Martin[7] reports 120 of these cases, with two maternal deaths, or 1.7 per cent mortality and 3.3 per cent fetal mortality. He states that the advantage of this method is that it can be done in potentially infected cases and in those with a high fever. Von Mikuliecz-Radecki[8] reports three cases of vaginal cesarean section with one maternal death by infection.

Essen-Moeller did vaginal section 27 times with two maternal deaths and 17 fetal deaths. He states that the principal risk in this method is that the incision is not carried high enough in the cervix, so that it tears with delivery of the baby, and for this reason cannot be sutured properly. As a consequence postpartum hemorrhage may result. He uses vaginal section in cases where it is important to bring labor to an end, although the cervix is not fully dilated, and when abdominal section is contraindicated.

In conclusion, we may state that at the Brooklyn Hospital the routine procedure in marginal placenta previa cases is, first, to rupture the membranes and apply a tight abdominal binder. In most cases this will control the hemorrhage and labor will proceed normally. In those that continue bleeding, the vagina is packed, or a bag inserted, until the cervix is open sufficiently to perform a Braxton-Hicks' version, even though this may sacrifice the baby. Transfusion is always used when necessary.

We do not feel that cesarean section is indicated in every case of lateral or central previa. At least two of our deaths, namely, the patient with puerperal infection, who was packed outside the hospital, and the patient who died on the table from blood lost before admission, could not have been saved by cesarean section. If these two are excluded from the series our maternal mortality would be

only 4½ per cent which would compare favorably with many of the cesarean section series reported in the literature.

From an analysis of our cases we think that abdominal cesarean section should be used only in selected cases. We fail to see how cesarean section will control a hemorrhage, empty a uterus, and prevent postpartum hemorrhage in every case of placenta previa easier than a Braxton-Hicks' version with later delivery. We lost only one patient by Braxton-Hicks' version from postpartum hemorrhage, and feel that this case was not properly handled. The other patient treated by this method was infected from a source outside the hospital. Of the two remaining deaths, one patient was almost dead on admission from loss of blood, and the last was treated by version and immediate extraction, which method we now condemn, in preference to the Braxton-Hicks' version with later delivery.

The ideal case of placenta previa for cesarean section is, in our opinion, a full-term primipara, with a long, rigid cervix, with the baby alive and viable and in whom there has not been too much blood loss.

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384 Sterling Place.

(For discussion, see page 604.)

Wozak, J.: Prophylactic and Therapeutic Use of the Warnekros Serum In Cases of Puerperal Fever. Monatschr. f. Geburtsh. u. Gynäk. **81:** 176, 1929.

In 1926 Warnekros, Louros and Becker reported on the use of a polyvalent streptococcus serum and since then reports have come from the Dresden clinic extolling the use of this serum especially as a prophylactic measure against puerperal sepsis. Wozak used this serum on 25 patients in seven of which the serum was given prophylactically. No difference was noted between these cases and 6 control patients who received no serum. However, in the cases where the serum was given therapeutically, some benefit was observed. The serum does not replace the other modes of treatment, it simply aids them.

J. P. Greenhill.

THE PLACE OF THE PORRO OPERATION IN MODERN OBSTETRICS

By Samuel S. Rosenfeld, M.D., F.A.C.S., New York, N. Y.

THE transperitoneal, the extraperitoneal, and the drainage technics, employed in performing cesarean section, have saved the lives of many mothers and babies. The brilliant results obtained by these methods should not cause us to neglect an operation, which in the indicated case, is both life-saving and efficient. I have reference to the Porro operation, or as it is now usually performed, should be designated as cesarean section followed by supravaginal hysterectomy.

The ideal indication for the performance of cesarean section and supravaginal hysterectomy is found in a patient who has a frankly infected uterus, especially so, if she has reached the age where the childbearing period is about completed. By employing this operation, one is enabled to deliver a living child and at the same time remove a large, involuting, boggy, infected and partly necrosing organ, which, theoretically at least, should make for a low mortality and smooth convalescence.

The commonly accepted indications for this operation are the presence of large fibroids where myomectomy is unsuitable, uncontrollable hemorrhage at the time of cesarean section, rupture of the uterus, tears or lacerations of the uterus inflicted during attempts at delivery, especially when infection is present. Osteomalacia is also regarded as an indication for supravaginal amputation.

The following cases will illustrate the type of patient in which the author favors the Porro principle:

Case 1.—Mrs. F. C., aged forty-three, born in Italy, gravida xi, para vii. Her periods were regular and the last was in June, 1928. All labors had been difficult. The fifth child was delivered by craniotomy and the sixth died twenty-four hours after a difficult forceps delivery.

I saw her for the first time on March 22, 1928. She was in a private sanatorium and had been in active labor for three days. The membranes had ruptured on the second day of labor. She had had many vaginal examinations and her temperature was over 102° F. by mouth. The woman appeared toxic and stuporous. Examination showed a full-term pregnant uterus, vertex presentation head unengaged. The fetus was apparently of average size. The heart sounds were rapid but regular. On vaginal examination I found that the cervix was leathery in consistency and dilated to the extent of three fingers. The pelvis was contracted, of the flat rachitic type.

There were several ways in which delivery could have been effected. One could have waited until the cervix had become fully dilated and hoped for spontaneous delivery. I rejected this possibility as improbable. Then again, delivery might have been effected by completing the dilatation of the cervix manually and de-

livering by either version or high forceps. I regarded this method as too dangerous. The cervix and the lower uterine segment felt friable and impressed me as the type that would rupture on the application of any undue force. Craniotomy I rejected, because it would have been a difficult procedure in this paitent and the danger of uterine rupture was as great as in the case of either version or high forceps. In addition the fetus was alive. I seriously considered one of the transperitoneal cesarean operations but was deterred by the almost certain presence of a uterine infection. The fear of infection and the fact that the patient had living children and was nearing the climacterium made me decide to do a Porro operation. She was transferred to the Lebanon Hospital, and under spinal anesthesia I made a midline incision reaching from the symphisis to the umbilicus. After thoroughly walling off the abdominal cavity, the uterus was incised and a normal living infant delivered, weighing six pounds and eight ounces. I then performed a typical supravaginal hysterectomy by the clamp method. On cutting across the supravaginal portion of the cervix about a half ounce of pus welled up into the wound. Culture of this pus revealed the Streptococcus albus. Microscopic examination of the uterus showed that the mucosa and submucosa were infiltrated by numerus pus cells.

The abdominal wall was closed in layers, inserting two drains into the peritoneal cavity. The wound became infected, and broke down almost completely. The Bacillus coli and an undetermined streptococcus were cultured from this wound. The patient also developed a severe throat infection which was clinically diagnosed as Vincent's angina. In addition, she developed a thrombophlebitis of the right saphenous vein. Blood cultures were sterile.

She and her baby were discharged from the hospital in good condition.

I recently examined her and found the abdominal scar firm. There was no evidence of hernia. Pelvic examination disclosed no unusual findings.

CASE 2.—Mrs. D. G., white, aged twenty-four, para i, went into active labor four days previous to admission to Lebanon Hospital. Her membranes ruptured on the previous day. The blood Wassermann reaction examined in the hospital was 4-plus.

The patient was very obese, well developed, appeared exhausted. The radial pulse was very rapid and thready and the cardiac sounds of poor quality. The abdomen showed a very large full-term uterus, the fetal back was on the right side. The fetal heart could not be heard. The head was not well engaged. The pelvis was contracted, of the simple flat variety, the cervix fully dilated.

Because the fetal heart which had previously been readily heard and located by her family physician, could not now be heard, I decided that craniotomy was the best method of delivery. Craniotomy was attempted but the fetus was so huge it was impossible to deliver it. On examination a tear into the broad ligament was found. Immediate laparatomy done, the entire uterus was brought out on the anterior abdominal wall and removed unopened, by the clamp method. The peritoneal cavity was drained through the cervix by a cigarette drain. The abdomen was closed in layers.

Her convalescence and recovery were satisfactory, except for a painful right hip and knee which the orthopedist thought was specific in origin. She left the hospital in good condition.

2021 GRAND CONCOURSE.

POSTPARTUM CARE*

By Charles Edwin Galloway, M.D., F.A.C.S., Evanston, Ill.
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THE importance of labor and delivery has overshadowed the prenatal and postnatal period with the consequence that the proper conduct of the obstetric patient before and after delivery has not been developed until recent years. Prenatal care is scarcely thirty years old and we have barely scratched the surface of its possibilities. Nevertheless, the conduct of pregnancy today constitutes one of the best examples of preventive medicine that the medical profession has developed.

The period following delivery, however, has not received the consideration and thought that it deserves as is evidenced by the fact that very little has been published concerning postnatal care and that mostly within the last ten years. Here then is still another field of preventive medicine that we should endeavor to develop more thoroughly. It is with the hope of stimulating interest in the conduct of the puerperium that this paper is written.

Two things stand out in the general consideration of postpartum care; one is the fact that an obstetric case cannot be divided into three separate parts—prenatal, natal and postnatal—and the other thing which must always be kept in mind is that although a careful and thorough routine is beneficial, each case must be treated individually if the best results are to be attained. We should also bear in mind the relative importance of each of the three divisions of an obstetric case. Labor and delivery should certainly receive the majority of our thought and attention for their potential dangers are by far the greatest.

IMMEDIATE PERIOD

The three great causes of maternal death in obstetrics are hemorrhage, infection and toxemia. The prevention of these three things, therefore, should occupy the foreground during the immediate period.

Hemorrhage.—At the Evanston Hospital during the last eight years out of a total of 6,679 deliveries we have had 153 cases where bleeding during or after the third stage of labor exceeded the average enough to be classed as hemorrhage. Our average estimated loss of blood is under 200 c.c.

We believe that one of the chief factors in preventing hemorrhage is the kind and amount of anesthesia administered during labor. If

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the patient is delivered under ethylene or nitrous oxide, her uterus will have a better tonus. We also think that the administration of pituitrin at the beginning of the third stage of labor lessens the loss of blood. Scott[27] analyzed 2000 cases at the Evanston Hospital in half of which no pituitrin was used, while the other half received it. The average estimated loss of blood was reduced from 243 to 198. The prolongation of labor after the head has reached a safe level for outlet forceps and episiotomy will contribute to atony of the uterus. Retention of membrane or placenta also causes bleeding. Laceration of the cervix and all other damage to the birth canal we advocate repairing at the time of delivery.

If the uterus shows a tendency to soften and bleed, it should be massaged, all clots should be expressed and pituitrin or ergot or both administered. If bleeding continues, the uterus should be packed with gauze. The bleeding can generally be controlled by the above measures because, as Fieux has shown, it is generally venous in origin and under low pressure. The uterus should be packed early. A hemorrhage that has been stopped only after the pulse rate has gone up and the blood pressure has been lowered has been stopped too late.

A knowledge of the patient's blood condition before delivery will also help to prevent what seems at times to be a severe reaction from an average amount of bleeding. If a patient with severe anemia has been grouped and matched and we have a donor on hand, she will benefit by the saving of time if transfusion is needed.

Infection.—Every obstetric patient should be treated with the same careful aseptic technic as a patient requiring major surgery. The chief cause of infection is contamination or the introduction of pathogenic bacteria into the birth canal. It is to prevent such contamination that we use rectal examinations during labor. During the past year we have injected 4 per cent mercurochrome solution into the vagina preceding all vaginal examinations. Whether this has actually reduced infection we cannot say but it would seem reasonable to use it. Schottmueller, Schwartz, Diekman and Brown have all been able to demonstrate anerobic streptococci in the vagina and on the basis of this fact the injection of various nontoxic germicidal solutions into the vagina at the start of labor has been advocated.

Every precaution should be employed to prevent infection during delivery, however, and no careless or inadequately trained student nurse permitted to contaminate the patient as soon as she reaches her bed. The average hospital patient can be infected by about six different people, and it behooves the doctor in charge to be familiar with what goes on following delivery. No one with any infection, especially of the nose and throat or hands, should be permitted in an obstetric ward nor should the obstetric interns and nurses be caring for anyone

having an infection of any kind. The ideal situation in any hospital would be to have the infected cases, both obstetric and gynecologic, handled on a separate service.

The vulva should be treated as an open wound regardless of whether there has been a laceration or not. Sterile pads should be applied and changed after each urination and bowel movement or as often as is necessary. This question was asked in a recent questionnaire sent out by the author and Dr. Philip Smith in connection with the White House Conference on Child Health and Protection, and it was answered 158 to 1 in the affirmative. One hundred and forty-three out of 159 use pitcher irrigations also as a matter of cleanliness, comfort and prevention.

Another type of infection seen during pregnancy and the puerperium might be termed metastatic. Foci of infection in teeth, tonsils, sinuses and kidneys should be cleared up as early in pregnancy as possible. Such foci of infection contribute to abortion, pyelitis, mastitis and toxemia and it is not too far-fetched to assume that they may cause a puerperal fever. Here again we see the possibility of preventive medicine during the puerperium. A year ago, November 6, I instituted a routine full mouth x-ray examination as a part of the first prenatal examination. Since then 193 patients have come for the care of pregnancy. Forty-nine of these had had their teeth x-rayed within four months which shows they are a class of women accustomed to good dental care but out of the remaining 144, 28 were found to have abscessed teeth. Twenty-three of these women had extractions, 4 refused, and 1 had the abscess drained. Two of these x-rays led to the discovery of infected antrums, both of which were treated. Three patients had tonsillectomies during the first trimester. Last year 9 patients were tonsillectomized.

The treatment of puerperal fever is outside the scope of this paper as I desire to deal more with the preventive side of things. We feel, however, that the conservative treatment with rest, food, sunshine, posture for drainage, ergot and good nursing care will yield the best results. There are too many cases that are actively treated early in the disease where a cure is reported that probably would have done better if left alone.

Eclampsia.—Eclampsia occurs only about once in every five hundred private obstetric cases, which means that it is rather rare. On the other hand, our present-day statistics show that 26 per cent of the deaths in obstetrics are due to eclampsia. About one-fifth of the cases of eclampsia occur following delivery, the great majority of them within forty-eight hours. Eclampsia must be regarded as a preventable disease. Even the cases reported as having a very sudden and unexpected onset could be detected before convulsions occurred if those in attendance were alert. If the patient is toxic, local

anesthesia and narcotics should be used in place of a general anesthetic whenever possible. If the patient has shown evidence of toxemia prior to delivery, she should be treated as a case of eclampsia following delivery for at least forty-eight hours. She should have frequent blood pressure readings, a record of the intake and output of fluids, fluids abundantly by mouth or by vein, nothing but liquid diet and absolute rest with sufficient morphine, chloral and bromides to lower the sensitiveness of the central nervous system to where convulsion will not be apt to occur. If every case coming from the delivery room is observed carefully enough, there will be no eclampsia.

Sleep and Pain.—It is my practice to give morphine rather freely following delivery. It can be given during the repair or as the patient leaves the delivery table, considering, of course, any previous administration of narcotics. If later on during the first few days pelvic cramps, breast engorgement or pain in the wound is not relieved by the ordinary analgesics by mouth, morphine or codeine should be given by hypodermic. The patient should never be restless or kept awake because of pain. One of the most important factors in the recovery of the puerperant is sleep. None of our hospitals give the patient sufficient time in which to sleep and rest. I give my patients a sedative the first three nights with instruction to the nurse to give an additional dose if the patient is still awake. The two o'clock (A.M.) feeding is eliminated in all cases during the first week. In the questionnaire referred to before, 57 out of the 159 give a sedative routinely during the early puerperium.

Bladder and Bowel.—The bladder should never be allowed to become distended. One or two catheterizations to prevent distention are safer than repeated catheterization over a period of days because of the atony produced when a bladder is overfilled. We have the patient catheterized if at the end of twelve hours all attempts to get her to void have failed. She is not allowed to go even a few hours, however, if palpation or percussion shows her bladder is distended. Once a catheter is passed, it is very essential that there be no residual urine after the patient starts to void. Test catheterizations should be made to determine this fact. Here as in all other parts of postnatal care a certain amount of routine will help but better results will be attained if each case is observed carefully and treated individually.

Most men agree that castor oil or other cathartic following delivery is not necessary. Even the discomfort it produces and possible restlessness are sufficient to condemn it. McPherson[21] demonstrated ten years ago that fever is twice as prevalent among those getting castor oil compared with those who do not. We give our patients mineral oil each night and even this has to be discontinued in certain cases because of loose stool and discomfort. Those patients not having movements are given a soap suds enema but never more often than

every forty-eight hours. The diet probably helps to regulate the bowels as much as anything. The ordinary obstetric patient can have a full tray within twenty-four hours after delivery.

Involution of the Uterus.—Under the immediate puerperium I wish to include a few of the most important points concerning the involution of the uterus, for it is probably the most important physiologic change taking place during the puerperium. Miller[20] of Edinburgh reports the incidence of subinvolution there as being about 12 per cent.

Teacher[34] and Wormser[39] both show that the most important factor in the involution of the uterus is proper separation of the placenta and the complete removal of all the products of conception. This means that subinvolution of the uterus is to be prevented by proper conduct of the third stage of labor. They show that infection, either local or general, has very little influence on involution. The other factor next in importance is the position of the uterus. This will be discussed later under posture and exercise.

Anemia.—Every parturient should be examined a number of times for anemia not only because of the blood loss occurring at delivery but because the majority develop anemia during pregnancy and a very few develop a pernicious-like anemia either during the last trimester or the early puerperium. The three conditions which most commonly cause this lowering of the red cell count and hemoglobin are hydremia, destruction of erythrocytes in the placenta, and infection, especially focal infection and syphilis. If dilution alone accounted for the anemia of pregnancy, the patients would not respond to treatment which a good many do and a certain number would not show a decrease in hemoglobin and red cells without hemorrhage during the two weeks following delivery when the hydremia is supposed to disappear. Nor will dilution explain the long-drawn out return to normal of certain cases where there was a normal blood picture prior to pregnancy and a severe anemia at term.

The condition of the blood should, therefore, be known at the time of delivery. We also take a blood count on the day after delivery, the twelfth day and the sixth or eighth week. I have studied about five hundred private obstetric cases from the standpoint of anemia and I know that enough of them respond to treatment to warrant giving it. Treatment is seldom instituted unless the hemoglobin is below 65 per cent (S.U.) or the red cells under 3,500,000. Liver extract, liver itself and iron are used as recommended by Keefer and Yang.[17] They have shown that liver and iron together are more effective than either one alone. Whipple[37] has also recently recommended the use of liver extract in the treatment of secondary anemia.

Posture and Exercise.—One of the most important parts of postnatal care is the exercise and posture prescribed. An obstetric patient

can very easily be too quiet although more commonly they are too active. The four things that we think are accomplished by posture and exercise are drainage leading to less infection, better circulation leading to better involution, prevention of thrombosis with its attendant danger of embolism and a general improvement of the skeletal muscle tone. We prescribe the back rest and face position the third day, the wheel chair the sixth, steps the ninth and the patient leaves the hospital on the twelfth postpartum day.

On leaving the hospital she is shown how to take the knee-chest position and told to use it at least twice a day for ten minutes until her final examination at six or eight weeks. As soon as bloody lochia stops, I give my patients bed calesthenics. The day she leaves the hospital, she is examined and a rectal examination is made. As in labor everything one needs to know can be ascertained with the rectal finger. I have seen several patients showing infection following vaginal examinations at the twelfth postpartum day, one of which came to operation later.

Posture will also prevent retroversion but just how important retroversion is during the puerperium has never been definitely proved by a well controlled series of cases. That it has some importance there is no doubt, for a few patients having retroversion bleed longer and stop bleeding shortly after the uterus is reposited. They have backache also which disappears when treatment is instituted. The majority or those having retroversion of the uterus, however, make a normal recovery in the normal length of time. Stacy,[32] Lynch, Plass, and Danforth[5] with the author have each reported one thousand cases where, among other things, the position of the uterus was noted and all four authors agree that 20 per cent of all women at the child-bearing age have a retroverted uterus. In our series of 1000 private patients, 144 had a retroverted uterus at the eighth week but only 19 of these complained of anything such as prolonged bleeding or backache following delivery. We think such cases should be treated by reposition of the uterus and insertion of a pessary. We believe that the uterus should not be dealt with manually, however, unless it is producing symptoms. Many cases of retroversion need not be interfered with in any way for they are symptom-free and make complete recovery in the normal length of time.

INTERMEDIATE PERIOD

This is the most neglected period of all. The patient cannot be out and about. She has been carefully watched through pregnancy and has had careful attention through labor and the two weeks following. She then finds herself fairly closely confined with the burden of a new responsibility and in this new responsibility she needs

intelligent help. Most of the problems the young mother must face after returning home are nursing problems that can be dealt with by a well-trained nurse who is in close touch with the obstetrician. The Visiting Nurse Association takes care of the poor and the rich can employ registered nurses but the average family must rely upon a relative or a practical baby nurse. The majority of these relatives and practical nurses are incompetent, which means that the advice and help given is not what it could be if a little intelligent supervision were added.

Visiting Nurse.—During the past two years I have employed a registered nurse to help me supervise the care of the patient from the time she leaves the hospital until she is again able to come to the office at from five to eight weeks. I have yet to hear of a patient who did not appreciate her help. She furnishes me with a daily report showing the patients visited and keeps a written record which is filed with the record of the pregnancy and labor. Her questions are numerous at times but are gladly answered, and she is instructed daily about the patient's care. She has, in turn, through her own supervision and instruction, organized a group of well-trained practical nurses. As her experience grows, she becomes better fitted to solve the problems that so often disturb the successful recovery of a nursing mother. She also visits the patient before delivery far enough in advance to help her in procuring proper equipment. She makes house calls, also, that are secondary to my own visits such as in cases of early threatened abortion, hyperthyroids confined for a time, and cases of early toxemia. She may also come to my assistance in cases of emergency. A more detailed report of this nurse's work is to be published later.

The final examination is generally made at the eighth week but if the visiting nurse has reported anything wrong, the patient is examined at the end of the fifth week. This examination should consist of a general physical examination and should include her blood pressure, urine, red cells, hemoglobin, weight, a bimanual pelvic examination and an inspection of the vagina and cervix with a speculum. Malposition should be corrected unless symptom-free. If a pessary is used, it should remain in place about two months and its position should be checked a few days after it is inserted.

The granular cervicitis so often seen at this time should be cauterized with the electric wire cautery after which the patient should take a daily douche for at least two weeks. These patients should be seen once a month and if needed, the cautery should be used again. They seldom need more than one cauterization and I have never used more than three. These cauterizations may be carried out even though the patient is given a pessary.

REMOTE PUERPERIUM

Cases needing care for many weeks following delivery are generally complicated by one of the following: tuberculosis, heart trouble, thyroid disease, urinary tract infection, nephritis, syphilis, or gonorrhea. Most of these patients call for the care of a medical consultant if the case is being handled by an obstetrician but it falls to the one in charge to be alert to their possibilities.

The last thing I wish to mention and certainly not the least concerns the old saying "for every baby a tooth." Bauer, Albright and Aub[2] have shown that potassium, magnesium, sodium, and chlorine can all be husbanded in the body but that calcium and phosphorus must be furnished in certain minimal quantities every day. They say that a certain amount of calcium must be excreted each day either because calcium is necessary to neutralize acids or because the calcium liberated by catabolism is not available for anabolism. They also show that this same calcium is not available for the fetus and that the calcium excreted during pregnancy is about the normal amount. Sherman[28] has shown that for every 70 kg. a man needs 0.45 gm. of calcium every day and suggests that calcium be added to the diet. The value of vitamin D, now available either in cod liver oil or viosterol, and its relationship to the assimilation of calcium has long been established. The recent work of Hanke,[40] however, at the University of Chicago brings out the very interesting fact that calcium and vitamin D are of no avail unless accompanied by a diet rich in vitamin C. He shows that caries develop in teeth because there is not sufficient vitamin C in the diet and not because calcium and vitamin D are lacking or because of any acid condition in the mouth.

Out of 191 cases that Hanke has studied (these were not pregnant women) only 17 were free from dental disorders and none of these 17 were eating a diet deficient in vitamins. The remaining 174 were all eating a diet deficient in vitamin C. He therefore prescribes a diet rich in vitamin C and the results which he has obtained are very striking.

Putting these known facts together then we may conclude that in order to protect the teeth during pregnancy and lactation we should not only prescribe calcium, vitamin D and sunshine but we should further insure the patient's health by prescribing a diet which contains an abundance of vitamin C.

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(For discussion, see page 599.)

OVARIAN CYST COMPLICATING PREGNANCY*

By Charles E. Caverly, M.D., New York

THE purpose of this paper is to present the results of an analysis of the records of 83 cases of pregnancy complicated by ovarian cysts. Thirty-seven of the cases are from the records of the Sloane Hospital for Women. The remaining 46 were gathered from case reports appearing in the literature. Lutein cysts accompanying hydatidiform mole, and solid ovarian tumors other than dermoid cysts have been excluded as not being immediately pertinent to the subject.

From October, 1921, when the present system of cross-indexing in the record room of the Sloane Hospital was instituted, to January, 1930, a period of eight years and two months, 16,818 cases of pregnancy were seen at the hospital. Of this number, ovarian cyst as a complication was found in 33, an incidence of one in 509.6. This incidence is undoubtedly high, because of the character of the service from which it is derived.

McKerron, in 1903, published an exhaustive analysis of the cases in the literature up to that time. He collected a total of 1,290 cases, and found the incidence to be one in 2,500 pregnancies. Spencer, in 1920, collected a smaller series, 55 in number, but he does not give the incidence.

*Read, by invitation, at a meeting of the New York Obstetrical Society, November 11, 1930.

From the literature appearing from 1920 to 1926 I have collected 46 cases which were given in such detail as to fall in line with my study of the cases from the Sloane Hospital. Thus, the records of 83 cases of pregnancy complicated by ovarian cyst have been reviewed and analyzed. The present communication is the result of this study.

Age and Gravidity.—Among 80 patients whose ages were definitely stated, the average age was found to be twenty-eight years. Spencer found the average age of his 55 patients to be thirty years.

Of 79 patients, 35 (44 per cent) were primigravid, while 44 (56 per cent) were parous. The parous women had had an average of 2.2 babies and one abortion each before the pregnancy in which the cyst was diagnosed. Spencer found an average of nearly three babies per patient before ovariotomy.

There is, however, some evidence that ovarian cysts are prejudicial to conception. Souba so holds, and cites the greater frequency of ovarian cysts in nulliparous women as compared with pregnant or parous women. Simpson estimated that one in ten married women are sterile, while one in three and one-half married women with ovarian tumor are sterile. Dieulafe records 42 cases of sterility in young women in whom unilateral cyst of the ovary was found and removed, and of whom 33 became pregnant within three years after the operation.

Pathology.—In 83 cases the cysts were found to be bilateral in 4, and unilateral in 79 (95.2 per cent).

The character of the cysts in 68 cases was noted as being: dermoid in 33; serous in 21; luetin in 4; parovarian in 4; papillary serous cyst-adenoma in 1; and pseudomucinous cystadenoma in 5. It is rather striking that the number of the common pseudomucinous cyst-adenoma should be so small. To simplify this classification: the cysts were dermoids in 48.5 per cent of the cases, and of other varieties in 51.5 per cent. McKerron and Spencer, on the other hand, found other varieties to be roughly three times as numerous as dermoids.

Of 87 cysts (4 of the cases being bilateral), 45 (51.7 per cent) were found to be situated in the true pelvis, and 42 (48.3 per cent) to lie above the pelvic brim, in the iliac fossa or in the abdomen. This almost equal distribution as regards location is at variance with the findings of McKerron, who, in 1,290 cases, found only 327, or 25.3 per cent of the tumors in the pelvis. Two of the 87 cysts, noted as being pelvic when diagnosed, were seen to rise above the brim spontaneously, one before, and one during labor.

Of 40 cysts lying in the pelvis, 24 (60 per cent) were dermoids; 16 (40 per cent) were other sorts. While of 38 cysts above the brim, 9 (23.7 per cent) were dermoids, and 29 (76.3 per cent) were other sorts. This confirms the clinical fact that the cyst most likely to remain in the pelvis and to obstruct labor is the dermoid.

As to whether the coexistence of pregnancy causes an ovarian cyst to grow, the evidence seems to be contradictory. In none of the 37 Sloane cases was increase in size of the cyst noted, although 10 of the patients were observed for an average of forty-seven days each, in all stages of pregnancy. Among 46 collected cases, a gradual enlargement was recorded in 4, not counting sudden enlargement caused by torsion of the pedicle and hemorrhage into the cyst. Williams and Spencer found that pregnancy had no influence upon the growth of the cyst, while Patton found a rapid enlargement in 11.8 per cent of 321 cases, probably due in most cases to acute complications in the cysts.

Symptoms.—The symptoms met with were: discomfort, dyspnea and palpitation due to abdominal enlargement in the case of large cysts above the brim; bladder irritability and constipation, the mechanical effects of pressure upon the bladder or rectum; ascites; edema; a sense of weight in the region of the affected ovary, or a bearing-down sensation in the pelvis, in the case of pelvic tumors; pains or soreness above the pubis, in one or the other lower quadrant, or in the pelvis, due to peritoneal irritation from friction of the cyst, or to the stretching of adhesions, where these existed; and, in the presence of torsion of the pedicle with strangulation, symptoms suggestive of acute ileus, i.e., violent, constant pain, vomiting, intestinal distention, shock and collapse.

Tumors incarcerated in the pelvis, and not removed before the onset of labor, caused obstruction. On the other hand, the natural process as a result of which pelvic tumors oftentimes do not obstruct labor was illustrated in the two cases where the cysts were spontaneously pulled up out of the pelvis and above the brim, one as the uterus enlarged during pregnancy, and the other during the progress of labor. Tumors above the brim were seen to interfere with labor by preventing engagement, by deviating the axis of the uterus, and by causing prolonged labor.

Of 73 cases where the records bore on the point, 46, or 63 per cent, had subjective symptoms either during pregnancy or after delivery; the remaining 27, or 37 per cent, had none. In 26 (35.6 per cent) the symptoms were classified as being mild or moderate, and in 20 (27.4 per cent), as severe. The symptoms occurred antepartum in 41 cases (56.2 per cent), and postpartum in 5 (6.8 per cent). In other words, of 46 cases of pregnancy complicated by ovarian cyst which showed symptoms, these latter occurred after the termination of labor in 5, or 10.9 per cent, showing that although the hazard from an ovarian cyst is less after delivery than it is during pregnancy, it is by no means ended with the birth of the child.

In the causation of symptoms, the location of the cyst, rather than its character, seems to be the determining factor. Thus, of 38 abdomi-

nal tumors, 35 (92.1 per cent) caused symptoms, whereas of 37 pelvic cysts, only 11 (29.7 per cent) caused symptoms. As a corollary of this greater frequency of symptoms with abdominal as compared with pelvic tumors, and of the relative frequency of dermoids within the true pelvis and of other kinds of cysts above the brim, it follows that symptoms are caused by other varieties of cysts more than by dermoids. Thus, of 41 patients with symptoms where the character of the cyst was determined, it was found to be of other sorts in 29 (70.7 per cent), and dermoid in only 12 (29.3 per cent).

Complications.—Complications arising in the cyst itself were: torsion of the pedicle, hemorrhage into the cyst, suppuration, and adhesions. Adhesions alone are of little clinical significance, and may be considered a minor complication. On the other hand, torsion, hemorrhage, and suppuration are complications of major surgical importance. Some one or more of these occurred in 25 of the 83 cases studied, an incidence of 30.1 per cent. The time of occurrence was antepartum in 18 (21.7 per cent), postpartum in 6 (7.2 per cent), and intrapartum in 1. Maclean found some complication in 1 in every 4 cases of ovarian tumor complicating pregnancy. McKerron found the incidence of acute complications of the cyst to be 25 per cent during pregnancy, and 40 per cent in the puerperium.

Torsion of the pedicle occurred in 23 of 83 cases, a frequency of 27.7 per cent. It occurred antepartum in 18 cases (21.7 per cent), and postpartum in 5 (6 per cent). Of the 23 cysts so affected, 5 (21.7 per cent) were pelvic in location, while 18 (78.3 per cent) were above the brim; 7 (30 per cent) were dermoids, and 16 (70 per cent) were other sorts. Where the torsion was sufficient to cause strangulation of the pedicle, the condition was manifested by symptoms remarkably like those of acute intestinal obstruction. The frequency of the complication is given by different writers as varying between 9 per cent and 30.5 per cent.

Hemorrhage into the cyst was seen in 15, or 18.1 per cent, of 83 cases. It was seen antepartum in 10 of the cases (12 per cent), and postpartum in 5 (6 per cent). Of the 15 hemorrhagic cysts, 3 (20 per cent) were pelvic, and 12 (80 per cent) were abdominal; 1 (6.7 per cent) was a dermoid, and 14 (93.3 per cent) were of other varieties. The hemorrhage in most cases was found to be due to interference with the circulation of the cyst, caused by a tight torsion of the pedicle. A less common cause was trauma to the cyst, suffered during labor.

Suppuration of the cyst occurred in none of the 37 Sloane cases; it was seen in 1 of 46 collected cases, an incidence of 1 in 83, or 1.2 per cent. Older reports give a more frequent occurrence, the factor of difference undoubtedly being the greater frequency of ovariotomy during pregnancy in latter day practice. Many case reports are to

be found in older literature, the complication arising during prolonged labor or after delivery. Kynoch writes: "Axial rotation, rupture, and suppuration are prone to occur during the puerperium. Labor is the commonest cause of suppuration, infection being through genital tears or of intestinal origin." Patton found 6 cases of suppuration at or after labor in 95 cases treated expectantly, an incidence of 6.3 per cent. McKerron gives the incidence as 1.5 per cent during pregnancy, and 9 per cent during the puerperium.

Adhesions between the cyst and contiguous structures were found in 18, or 21.7 per cent, of 83 cases. This incidence of 21.7 per cent is comparatively low, Doran, in 15 cases, and Spencer, in 55, finding adhesions in 46.7 per cent and 47 per cent of cases, respectively. In 6 of the 18 cases with adhesions, torsion or torsion with hemorrhage was also seen. In the other 12 cases, adhesions alone were found, and were evidently the result of localized peritonitis, caused by simple friction of the cyst. The location of the cyst was pelvic in 8 (44.4 per cent) of the 18 cases, and above the brim in 10 (55.6 per cent) The character of the cyst was dermoid in 7 (38.9 per cent), and of other kinds in 11 (61.1 per cent).

Rupture of the cyst was seen in none of the 83 cases included in this study. However, instances of its occurrence abound in medical literature: witness the reports of Polak, Patton, Williams, McKerron and others. Its frequency is given by different writers as varying between 2.3 per cent and 13.6 per cent. Spencer reports an interesting case where a cyst was known to exist, where operation for its removal was refused, where, on the third day after normal delivery the patient went suddenly into collapse and died, from a spontaneous rupture of the cyst. Autopsy showed no torsion or other accident, save rupture, demonstrating the need of removing large cysts whenever and at whatever stage of pregnancy found.

Thus it is seen that, both as regards symptoms and as regards complications of the cyst, the potential danger to the patient from an ovarian cyst complicating pregnancy is not terminated with the completion of labor. On the contrary, the possible bruising of the cyst incident to labor, and the greater room in the abdomen and pelvis incident to delivery, and the rapid diminution in the size of the uterus postpartum, all go to make of the puerperium a time particularly liable to accident.

Diagnosis.—The diagnosis of ovarian cyst as a complication of pregnancy is frequently difficult to make. There may be no symptoms to suggest its presence. This is particularly true of small tumors lying protected in the pelvis. We have seen, in 73 cases reviewed above, that symptoms were entirely absent in 27, and that they appeared only after delivery in 5, leaving 41, or 56.2 per cent, of cases where symptoms were manifest during pregnancy. Moreover, the physical

findings are often misleading. Hard, semisolid dermoids, or cystic tumors made tense by pressure may be mistaken for fibroids. And the abdominal distention in the case of large, flaccid cysts may be erroneously attributed to hydramnios or to multiple pregnancy.

The diagnosis was made during pregnancy and before the onset of labor in 64 (77.1 per cent) of the 83 cases of this series. In contrast to this, McKerron, writing in 1903, says: "Eighty per cent of small tumors occupying the pelvis are found only upon pelvic examination in labor." The earlier diagnosis, with resultant more efficacious treatment in present-day obstetrics is the result of more general, careful antepartum care and examination.

Treatment.—The treatment in 82 cases, excluding one case where therapeutic abortion (and ovariotomy) was performed, lends itself to classification under three headings: (1) expectant treatment throughout pregnancy, under which are included cases of ovariotomy postpartum; (2) ovariotomy during pregnancy, and (3) cesarean section plus ovariotomy at term. Other methods of treatment, formerly in use, such as aspiration of the cyst, simple reposition, incision and drainage, induction of premature labor, vaginal ovariotomy, and intrapartum ovariotomy with subsequent delivery from below, are, I think, now quite generally discountenanced. Their limitations and disadvantages are obvious; their results will not be considered in detail here.

The comparative results of the three methods of treatment employed in 82 cases of this series are summarized in the accompanying table:

COMPARATIVE RESULTS OF THREE METHODS OF TREATMENT

	EXPECTANT TREATMENT	OVARIOTOMY ANTEPARTUM	CESAREAN AND OVARIOTOMY AT TERM[1]
Cases	26	35	21
Abortion or premature labor	8	4	
Per cent	30.8	11.1	
Normally through pregnancy	18	29	
Per cent	69.2	82.9	
Gross fetal mortality	8	7	1
Per cent	30.8	20	4.8
Corrected fetal mortality	8	5	0
Per cent	30.8	14.2	0
Maternal mortality	0	2	0
Per cent	0	5.7	0

It is seen that 26 patients were treated expectantly, either because the presence of the ovarian cyst was not diagnosed during pregnancy, or else in the hope that such a cyst, known to exist, would cause no trouble. Eight of the patients so treated aborted or went into labor prematurely. Fourteen went through pregnancy, labor, and delivery without mishap, while in four the cyst caused dystocia during labor. However, in 6 of these 14 normal cases removal of the cyst was

urgently indicated early in the puerperium because of torsion of its pedicle. Altogether, 15 of the 26 patients treated expectantly had an ovariotomy postpartum. The fetal mortality in the 26 cases was 8, or 30.8 per cent, while the maternal mortality was nil.

In comparison with the above group, are 35 cases in which ovariotomy was performed during pregnancy. Twenty-nine of the 35 patients went normally to term and through labor following the operation. Abortion or premature delivery of a nonviable fetus followed ovariotomy in 4 of the 35 patients. Two patients died undelivered from pulmonary embolus, one on the second day, and one on the twenty-fourth day after operation. Thus, the maternal mortality was 2, or 5.7 per cent. The gross fetal mortality was 7, including the 2 babies dead in utero of the mothers who succumbed. If we deduct one patient in whom abortion was imminently threatened upon admission and before operation, and another where death of the fetus occurred four months after operation as a result of accidental hemorrhage in a patient with toxemia of pregnancy, this gives a corrected fetal mortality of 5, or 14.2 per cent.

Eight of the 35 cases of ovariotomy during pregnancy were operated upon before the termination of the third month of pregnancy. There resulted two abortions, of which one was definitely threatened before operation. In 6 patients the corpus luteum of pregnancy was found in the ovary removed at operation, 1 at two months, 1 at two and one-half months, 3 at three months, and 1 at four months. The first aborted; the other 5 went normally to term. In this connection, Grosse quotes Frankel's experiments with rabbits, in which destruction of the corpus luteum during the first fourteen days of pregnancy was regularly followed by abortion, whereas its destruction after that time usually caused no untoward result. This influence of the corpus luteum corresponds with its anatomic evolution. In women such experiments are not possible, but clinical evidence seems to point to the first two months as being the period during which the corpus luteum is indispensable to the continuance of pregnancy.

Twenty-one cases were treated by cesarean section and ovariotomy at term. The maternal mortality was nil; the fetal mortality was 1, a baby dead in utero upon admission after neglected, prolonged labor with a dermoid cyst incarcerated in and obstructing the pelvis. Elimination of this case, which was clearly one of neglect, gives a corrected fetal mortality of nil.

Upon the basis of these results, cesarean plus ovariotomy at term would appear to be the method of treatment of choice. However, to wait until the pregnancy reaches full term would be to incur the risk of symptoms caused by the cyst, and that of major complications to the cyst, which risks, in this series, amount to 56.2 per cent and 21.7 per cent, respectively.

SUMMARY

1. The presence of an ovarian cyst seems to militate against impregnation. However, it is not incompatible with normal pregnancy, labor, and puerperium.

2. At the same time, an ovarian cyst is a serious complication of pregnancy, which, in hospital practice, is met with in about one in every 510 cases. It is seen with almost equal frequency in primigravid and in parous women.

3. In this series of 83 cases, the cysts were almost equally distributed, as to their character between dermoids and cysts of other varieties, and as to their location between those lying within the true pelvis and those above the level of the brim.

4. Subjective symptoms were noted in 56.2 per cent of the cases during pregnancy, and in 6.8 per cent during the puerperium.

5. Major complications of the cyst occurred in 21.7 per cent of cases during pregnancy, and in 7.2 per cent in the puerperium.

6. Both subjective symptoms and cyst complications during pregnancy and the puerperium were far more frequent with abdominal than with pelvic tumors, and more frequent with cysts of other sorts than with dermoids.

7. Ovariotomy is indicated in every case of pregnancy complicated by ovarian cyst. It should not be done during the first two months of pregnancy because of the possibility of removing the corpus luteum. If the presence of the cyst is first diagnosed in the last month of pregnancy, one of two courses would seem to be indicated: either to wait until full term and then to do a cesarean and ovariotomy, rather than to subject the fresh cicatrix of a recent operation to the strain of labor; or else, if labor and delivery promise to be uncomplicated, to let them occur normally, and then to do an ovariotomy early in the puerperium. When the diagnosis of ovarian cyst is first made in the puerperium, ovariotomy should be performed forthwith.

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3 EAST EIGHTY-SEVENTH STREET.

(For discussion, see page 598.)

Brock, J.: Uterine Irrigation With Alcohol During the Puerperium. Monatschr. f. Geburtsh. u. Gynäk. **77:** 3, 1927.

Most authors advise against irrigation of the uterus when there is fever during the puerperium. According to Brock, uterine irrigations are indicated where an infection is limited to the uterus, and the adnexa are uninvolved. If very little pressure is exerted there is no danger. Usually the irrigating fluid employed is a watery solution of some disinfectant but such solutions act superficially only and have no penetrating effect. The result is essentially a mechanical cleansing, and destruction of the bacteria which are on the surface of the uterine mucosa. Alcohol, on the other hand, acts not only on the surface of the uterus but also penetrates the uterine wall and destroys bacteria there also. The author irrigates the uterus once at the beginning of a septic infection of the uterus during the puerperium with one liter of a 40 per cent solution, and has always obtained remarkable results. The fever quickly subsides and the general condition of the patient improves rapidly.

J. P. GREENHILL.

Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS*

FORTY-THIRD ANNUAL MEETING

NIAGARA FALLS, CANADA, SEPTEMBER 15, 16, 17, 1930

THE PRESIDENT, DR. EDGAR A. VANDER VEER, IN THE CHAIR

(Continued from March issue)

The Elderly Primipara. Her Pregnancy and Labor. A Study of Over Three Hundred Cases, by DR.. JAMES K. QUIGLEY, Rochester, N. Y. (See page 234, February issue.)

Application in Forceps Extraction, by DR. PAUL T. HARPER, Albany, N. Y. (See page 280, February issue.)

Obstetrical Morbidity and End-Results, by DR. T. S. WELTON, Brooklyn, N. Y. (See page 263, February issue.)

DISCUSSION

DR. R. D. MUSSEY, ROCHESTER, MINN.—Dr. Quigley's observations on more than 300 first births by women more than thirty years of age should relieve the elderly primipara of her fear. However, as the age of the primipara advances toward forty years and more, the hazards to mother and infant are increased. Statistics gathered by the Children's Bureau of the Department of Labor show that among mothers who are less than twenty or more than forty years of age, maternal and infant death rates are higher. If I remember correctly, about 3 per cent of Dr. Quigley's patients were more than thirty-five years of age and that the large majority of his patients were between thirty and thirty-five.

The first factor is lowering of physiologic reserve. After thirty-five athletes usually lose in competition. Second, there is more or less replacement of the muscular tissue of the lower uterine segment and of the pelvic floor by fibrous tissue. Third, fibromyomas are more prone to develop in these patients. Twelve per cent of white women who are nearing the age of forty years have fibromyomas. Fourth, in this group hypertension is more evident. All of these factors add somewhat to the hazard of the mother and of the infant as the age of the mother increases.

Dr. Quigley appropriately brought out the fact that the necessity for cesarean section is increased among elderly primiparas; this is true because the elderly primipara is more likely to have fibromyomas. Several of Dr. Quigley's patients had fibromyomas. Another factor which gives weight to the advisability of cesarean section is that the age of these women lessens greatly the chances of their having other children if the first child is lost in a trial labor.

In a group of 1500 cases my colleagues and I found 48 primiparas (roughly 3 per cent) aged thirty-five years or more. Of these 48 patients, 7, or about a seventh, had fibromyomas; 17, or a little more than a third, had systolic blood pressures of 140 mm. of mercury or more, at some time in the course of pregnancy;

*The current volume of the Association Transactions will contain the complete discussions which cannot be presented here for lack of space, as well as those papers which were unsuited to the pages of this JOURNAL because of their purely surgical character.

10 of these had enough albumin in the urine to be of significance, and 6 had to be hospitalized on account of preeclamptic toxemia. None of the group had eclamptic convulsions.

Dr. Harper has given an excellent, rather idealistic description of the application of forceps. There is no question but that the medical students should be taught that only cephalic forceps should be applied. However, there are several points that may be brought out in connection with application of forceps and with the other methods that may be used. If the head is arrested in the inlet there is usually some reason for this arrest; usually it is either because there is more or less contraction of the inlet, or because of malposition of the head. With an adequate pelvic inlet, unruptured amniotic membranes, and arrest of descent of the head, version may be the method of choice. If the inlet is moderately contracted, the membranes ruptured, the fluid drained out, and the uterus contracted, either application of forceps or conservative delay may be indicated. Members of an Association like this must remember that those who are taking care of the greatest number of obstetric cases are general practitioners, or, rather, those who are not, as a rule, especially trained in obstetrics. The emphasis must be laid on conservative measures of treatment for labor; these consist in delay, administration of sedatives and induction of analgesia. In many instances what would be a very difficult case for application of forceps will become a very easy forceps delivery when delay has permitted further descent and rotation of the head.

I do not think much difference from Dr. Welton's opinions on maternal morbidity can exist. I agree that a temperature of 100.4° F., for two consecutive days following the first twenty-four hours, does not prove true morbidity. However, it seems to be the best standard that has been reached. I believe that Dr. Welton's suggestion in regard to the formation of new standards should be very carefully considered by this Association and by obstetricians in general.

DR. ARTHUR H. BILL, CLEVELAND, OHIO.—I agree with Dr. Harper except that I would say that a true cephalic application can be and should be made in every case and this method should be taught to students and residents who are learning obstetrics. Our test as to the proper application is this: After the forceps are applied we insist that the anterior edges of the blades should be parallel to and equally distant from the lamboid sutures. If this is the case we have a true cephalic application. Between each traction we check this to be sure that there is no slipping of the blades and that we constantly maintain this application throughout the whole delivery.

The important question is when the forceps are to be used and when not to be used. There has been considerable discussion of the inlet arrest of the head. I dislike very much to hear a discussion of the kind of application that should be made in inlet arrest. I feel that the sooner we stop experimenting with forceps designed for the inlet arrest, the better off we will be. We should not use high forceps. I believe that podalic version has replaced high forceps. To classify these methods I would draw a line through the pelvic inlet and should say forceps are indicated when the head has passed through the inlet, but when the head is arrested in the pelvic inlet or is above it, podalic version is the procedure of choice, and the only instance where high forceps should be used is the rare case in which the uterus will not relax sufficiently to allow podalic version to be performed. Even these cases may be avoided because for the most part they are neglected cases where a podalic version could have been performed earlier in the labor. I would especially emphasize my opinion that the sooner we stop discussing how to do high forceps and devising new means for doing so, the sooner will better obstetrics be performed. I am thoroughly convinced that there is greater damage done by high forceps, than by podalic version.

DR. E. A. SCHUMANN, PHILADELPHIA, PA.—My own experience has been in accord with Dr. Quigley's, though I should say that in elderly primipara my percentage of nephritic toxemia has been rather greater. I am more than in accord with him as regards the apparently high percentage of cesarean sections and I think he really did not emphasize that point sufficiently. The older the primipara the more important becomes the baby. One should never follow the statement which has been made in high places that first babies are experiments to determine the proportion or disproportion of the head, because elderly primipara will not attempt a second child if the first has been lost. Therefore, I think the elderly primipara should be protected, and if it is felt that fatal damage may result from vaginal extraction, great care should be taken. Having very decided views upon the matter of the test of labor, I am rather in discord with this subject. A test of labor, in my experience, has resulted so frequently in rupture of the membranes, making the moment of election for cesarean section impossible, that I have come to believe that the skilled specialist should be able to determine for himself the probabilities of successful pelvic delivery before labor is instituted. I would myself be inclined to err on the radical side and perhaps do an elective cesarean section in a woman who might otherwise deliver herself rather than to have delivery fail in one patient where the moment of election has passed and in whom a traumatic and difficult labor followed, with the probable loss of the child.

Dr. Bill has so thoroughly covered Dr. Harper's paper that there is little to add except to remind the audience that Dr. Harper used one expression, "stern necessity." My own experience with all transverse arrests is that those cases that have not been under the care of an obstetrician during the early stages of labor come in with a head moulded out of proportion, the membranes ruptured long since, the patient probably febrile and the opportunity for anything but a high forceps, or perhaps podalic version, long since past. In these cases with the uterus in tonic contraction, podalic version is rather a risky operation except in the hands of masters. It should be practiced in a greater proportion of cases than it is, but it is in these cases usually that high forceps must be done. Most of us cannot apply the ordinary instrument accurately to the sides of the fetal head, especially if there be marked deflection. However, these cases are rare. At the University of Pennsylvania we have been using the Barton forceps, but only in the neglected type of high transverse arrest which I have described. Sometimes the application of a Barton forceps is a matter of great difficulty and gives us great concern lest the lower uterine segment rupture.

DR. J. F. BALDWIN, COLUMBUS, O.—I heartily approve of the opposition to high forceps. We do not at our hospital permit high forceps without a previous consultation. Generally the man who wants to use them is a man of immature judgment or little experience. I usually prefer cesarean section. But the surgeon should be thoroughly, conscientiously, honestly convinced that cesarean section is the best procedure in individual cases before it is advised. It is done altogether too frequently now all over the country.

DR. I. W. POTTER, BUFFALO, N. Y.—The trouble with the elderly primipara has always seemed to me to be that she had a fibroid uterus and if we consider that she has a fibroid uterus, or a toxemia of late pregnancy, after the first stage of labor why not deliver her by elective version? When I heard such papers on forceps, I am inclined to think more and more of the elective version. The forceps operation for me has got to be a very simple affair. I do not like high forceps, nor forceps applied with the head arrested at the brim. I have done a great many cesarean sections, probably more than you would agree should have been done, but I do not think the average elderly primipara should be left to herself after the first stage of labor is over, she should be delivered and I do feel that the elderly

primipara with a breech presentation should be sectioned. I think that is one of the indications for the use of cesarean section.

DR. C. S. BACON, CHICAGO, ILL.—The difficulty with changing our definition of morbidity is in the uncertainty that would arise about the statistics. If we wish to call cases morbid that are judged morbid by the practitioner, then we bring in the subjective element, and we have no agreement among different men. One practitioner will find 1 per cent or 2 per cent and another will find 10 per cent or 20 per cent. If we use the index of temperature, there is no possibility of having any disagreement. I quite agree with Dr. Welton that temperature is not alone sufficient but I think it would be unfortunate to give up entirely the practice of using the temperature index to judge results of different clinics.

In the discussion of dystocias in elderly primiparae as well as the dystocias that lead to forceps, attention has been given chiefly to the difficulties at the pelvic inlet. I believe that more frequent than difficulties at the inlet are those difficulties in the dilatation of the cervix. The cervix dilates with perhaps less readiness in the case of elderly primipara and the long labor is usually due to the slow dilatation.

The same thing is true in determining upon the use of forceps. High forceps with a small inlet should not be thought of. The most difficult question to decide is whether the cervix is going to dilate when labor is allowed to go on a sufficient length of time. It would seem that in this discussion the question of the readiness of dilatation should always be given an important place.

The Kielland forceps in any position of the head is, I believe, the forceps of choice. It can be applied to the head in a transverse position as well as in the oblique. This instrument is only for the midforceps operation and the low forceps but never for the high forceps.

DR. QUIGLEY (closing).—Dr. Harper more particularly made a plea for cephalic application of forceps. I do not believe in high forceps as a rule but in a multipara, when the membranes have ruptured, the Barton forceps does wonderful work with a cephalic application, in a transverse arrest in the brim.

I think Dr. Welton struck a note that we all appreciate because we have all been working at this problem of morbidity and not getting anywhere with it. I suppose that started with the idea of perhaps comparing the morbidity in the different methods of examination, rectal, vaginal, etc. The true morbidity of any patient depends upon her condition six months after delivery.

In my paper I tried to make it clear that there is a certain group of patients, elderly primipara, who should have a test of labor. I am certainly unable to prejudge any woman with a normal sized pelvis, without any complication such as toxemia or fibroids, and I do not think there is any way to know what is going to happen unless we give them a test of labor. If we section them without a test of labor we would be doing an unnecessary number of such operations, because we have been agreeably surprised sometimes in seeing a head engage after trial labor. As to Dr. Potter's version at the end of the first stage of labor, I would not do it. I think I would do a section on that patient if the head does not come down.

DR. HARPER (closing).—I did not come here to "sell" high forceps as an operation. I rarely do the operation. I think it has no place except in the occasional case where a well-molded head has been down in the pelvis for hours, where the membranes have ruptured, where there is some retraction, and where version is out of the question. One has to do the occasional high forceps; but, in inlet arrest version is unquestionably the procedure of choice.

No more did I come here to "sell" the Barton forceps. And although Dr. Quigley believes the Barton to be a wonderful instrument, I dislike the thought of

what may happen when that anterior blade, inserted posteriorly, is swung around to the front. Under the circumstances, cord prolapse and partial placental separation are without doubt possible dangers.

I would stress the imperative necessity of teaching the idea that a cephalic application must be secured. I believe it is possible in every case. My students are advised that when an operative case is finished and the child bears forceps-pressure marks over other than the malar prominences, something other than a true cephalic application has been secured and that the case has been by so much imperfectly managed.

Dr. Polak spoke about developing the obstetric conscience. No bigger contribution can a teacher make than to strive constantly to develop this same "obstetrical conscience" on the part of those in his charge. Any full-grown can deliver a mother of a seven-pound baby one way or another; but little real credit accrues unless it is done properly. If our papers and our teaching are not idealistic, we will get nowhere along the line of lowered obstetric morbidity and mortality even with forty White House Conferences.

If our students are sent out appreciating the value of cephalic application in every case and knowing how to make it, there will be far fewer men fifteen years hence making poor applications and doing correspondingly poor obstetrics.

When forceps are used, of course the blades should be applied to the sides of the baby's head, and they should remain there until the head is about to be born. And when the latter event transpires, there should be no evidence of their having been placed anywhere else than at the sides of the fetal head.

Etiology and Significance of Necrosis of the Placenta, by DR. T. L. MONTGOMERY, Philadelphia, Pa. (For original article, see page 157, February issue.)

DISCUSSION

DR. J. R. McCORD, ATLANTA, GA.—I have studied about 3,500 placentas microscopically, particularly with reference to syphilis. I agree with Dr. Montgomery that the process he has described should be called a necrosis rather than an infarction. I have found this condition a vast number of times and feel that in a mature placenta it is something of a natural process. It is true that in the study of premature placentas we do not find this condition as we do in the mature or ripe placentas. While we have been taught that there is no definite histologic picture of a syphilitic placenta, there is a picture that does occur so often with syphilis as to make it be regarded as a syphilitic condition. I am not altogether convinced that the syphilitic placenta is an endarteritis.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—The only objection to Dr. Montgomery's theory might be that he has perhaps narrowed the cause of the change too much. One should check his impressions by applying broad biologic principles rather than taking up the exact end-changes that are seen under the microscope. It is perfectly reasonable to believe that fibrin is actually the contact agent, or the last agent that is at work producing these results, but back of the fibrin formation it would seem that one would have to give considerable attention to the status of the walls of the circulatory system.

The placenta in a broad sense is a decidual organ and when it reaches the stage of maturity it does not differ in ageing changes from any other tissue, or from the whole body, when it has reached the end of its physiologic existence. The processes that one observes are ageing processes, and are fundamentally vascular in type. It must be admitted that the actual agents that produce certain changes are the constituents of the blood, but when we describe the process

in terms of larger units of the body it seems that one should attribute them predominantly to the circulatory system.

I agree with Montgomery rather than with Williams in regard to the origin of the change, for it fulfills a fundamental rule in pathology. The more distal tissues, as a rule, will necrose earlier than the more proximal tissues for the very obvious reason that they are less adequately supplied with blood. Also the last formed tissues will be the first to degenerate, thus supporting Dr. Montgomery's contention.

DR. MONTGOMERY (closing).—One of the principal points in question in the consideration of this problem is the source of the necrotic changes in the placenta, whether they arise from the maternal or the fetal circulation.

We have brought evidence to indicate that the changes originate from some constituent of the maternal blood. We refer again to the points which have been suggested by Young and others, which demonstrate that the nutrition of the villous syncitium is not derived from the fetal placental circulation.

In the course of our paper we have conjectured as to the source and nature of the constituent of the maternal blood which causes necrosis. However, this phase of the problem requires further experimental study.

We are particularly opposed to the term "senile" as applied to the changes in the placental vessels, feeling that the collapsed state of certain vessels which suggests this appearance is secondary to necrosis of that portion of the placenta to which the vessel terminoles were distributed.

Nonspecific Vaginitis,* by DR. W. H. CONDIT, Minneapolis, Minn.

Vaginal Repair, by DR. A. J. RONGY, New York City. (See page 269, February issue.)

DISCUSSION

DR. DAVID HADDEN, OAKLAND, CALIF.—Dr. Rongy has emphasized the all too frequently overlooked facts regarding variations in pelvic structures, and it is these variations that must determine the methods of repair. The skillful and successful surgeon is the one who is able to adopt one method of repair to the case in hand. Any operation that has a rational foundation and that is based upon a thorough knowledge of the anatomy is capable of being made applicable to any type or degree of injury.

Dr. Rongy's preference for a median incision to enlarge the outlet should, I believe, be the preference of every obstetrician. It produces the least injury to tissus involved and consequently is the most easily repaired. If the incision is properly placed there need be no fear of injury to the sphincter ani. With the median incision we are dividing tissue along a central raphe and not cutting across muscle bellies as with a lateral incision. If the head and shoulders are properly controlled no injury to the sphincter need occur. If we fear extension of the tear produced, it is possible to direct the incision to the side of the sphincter which normally is only attached to the central tendon in the median line and has a definite cleavage line surrounding it laterally. The attachment to the coccyx in fact tends to retract it.

This last year I have had two patients who developed difficulty of intercourse because of pain. Both cases had an excellent result from an immediate repair. In one case the trouble appeared to be a spastic levator ani. Two deep novocaine injections into the muscle provided permanent relief. The other case was a vaginismus

*This paper will be found in the current volume of the Transactions of the Association.

evidently due to nerve constriction at the outlet. I made under local anesthesia a median incision through the mucous membrane, freeing it from the central tendon, and closing it horizontally. This also brought complete relief.

Drs. H. D. Furniss, E. L. Cornell, P. B. Bland, and C. S. Bacon also participated in the discussion.

DR. RONGY (closing).—I am convinced that the fallopian tubes have a definite relation to menstruation, because not infrequently have I observed a disturbance of the menstrual function after a surgical sterilization when the continuity of the fallopian tube has been disturbed. However, I find that the patient finally adjusts herself and the menstrual function becomes normal again.

Regarding the question of episiotomy as against perineotomy raised by Dr. Cornell, it is true that a large number of cases are not infected, but there is a definite small number of cases, which become infected subsequent to the episiotomy operation. It is these cases that I have in mind when they have to undergo secondary repair. The anatomy in such cases is much more distorted and it is more difficult to repair them than those patients who have had a median perineotomy.

Now, as to the more important phase of the subject: If the present conception of labor is to remain unchallenged, we shall have an increased number of cases of vaginal vault damage. The mechanics of labor, properly conceived and correctly interpreted, is not that of an algebraic progression of diameters of the fetal head in the pelvis, but of a geometric coordination of the fetal head and the pelvic basin during the entire progress of labor. This fundamental difference in the conception of the mechanism of labor accounts for much of the incompetent management in cases of malposition and malpresentation. If this point once is properly understood, the only logical forceps application is the cephalic application. Any deviation from that will cause great damage to the soft parts. The oblique application or the pelvic application may be utilized occasionally as a corrective measure, but the child's head must not be delivered except by a cephalic application.

The Joseph Price Foundation Lecture was given as a moving-picture demonstration by Professor Jean Louis Faure, University of Paris, France, in which he illustrated his method of performing hysterectomy for fibromyomata.

President's Address: **The Romance of the Abdomen,** by Dr. Edgar A. Vander Veer, Albany, N. Y.*

The Treatment of Hyperemesis Gravidarum, by Dr. H. B. Van Wyck, Toronto, Canada. (See page 243, February issue.)

Venoclysis, by Dr. W. T. McConnell, Louisville, Ky. (See page 250, February issue.)

Observations on Toxemic-Nephritic Group Cases With Especial Reference to Classification, by Dr. Foster S. Kellogg, Boston, Mass. (See page 275, February issue.)

*The President's Address will be published in the current volume of the Association's Transactions.

DISCUSSION

DR. PAUL TITUS, PITTSBURGH, PA.—Dr. Van Wyck in discussing treatment made a significant statement when he said in effect that any effort to draw distinctions between the various manifestations of toxemia at one time or another during pregnancy resolves itself merely into a classification of symptoms. I, too, am becoming more and more convinced that there is a definite relationship between all of the supposedly different toxemias of pregnancy.

In speaking of the intravenous use of dextrose in the treatment of these conditions both Drs. Van Wyck and McConnell referred to the possibility of overstimulation of the pancreas by overdosage of dextrose, thereby causing hyperinsulinism reactions. Dr. McConnell's fourth slide shows graphically the production and the prevention of this phenomenon, and is in correspondence with my own studies on the therapeutic dose of dextrose, published some time ago.

By making frequent blood-sugar readings during an intravenous injection of dextrose given at the maximum physiologic rate of Woodyatt, Wilder and Sansum (0.8 gm. per kilo body weight per hour) we found that the blood sugar first rises, then remains stationary for a time and then begins to fall quite rapidly. This we assumed to be the point at which an excess of endogenous insulin was beginning to be produced, and we concluded that the amount of sugar given up to this point (usually about 75 to 100 grams) represented a single, safe therapeutic dose. This is illustrated in the upper curve of Dr. McConnell's chart, and is being given there by the so-called intermittent or single dosage method.

By the continuous method, or venoclysis, this same overstimulation of the pancreas would probably occur, except that the rate of injection is so reduced or slowed that, as seen by the lower curve of this chart, there is never an excessive rise in blood sugar and likewise the corresponding fall from hyperinsulin production is lacking.

The secret of success from this method depends upon its being given several times more slowly than the same strength solution could be given by the single dosage method. This probably accounts for Dr. Van Wyck's excellent results.

Formerly I had preferred the single dosage exclusively but now use both methods according to indications and needs. Dextrose by venoclysis has an important therapeutic rôle but there are only a comparatively few patients who do not respond to the more simple single doses, frequently repeated. Whenever it is necessary we do not hesitate to cut down on a vein and use a cannula, but naturally one prefers to use a simple needle injection if possible.

An instrument developed in my clinic for intravenous dextrose injections, has on its dial valve not only the orifices for proper flow-rates for dextrose solutions of varying strength, but also one for this other method termed venoclysis. I mention this to indicate how important I now consider this method as an addition to the single dosage method.

DR. J. N. BELL, DETROIT, MICH.—Dr. McConnell mentioned introducing fluid into the peritoneal cavity but did not enlarge upon it, introducing a trocar just below the umbilicus and pouring water in through a funnel and tube. The first case that I tried it on just received 2000 c.c. of sterile water. That patient was about five and one-half months pregnant and one injection relieved her. She recovered and could retain her food and went on with the pregnancy. In the next patient we introduced 500 c.c. of a 10 per cent solution of glucose with 1500 c.c. of water and that patient got well. Those are only two cases but they are significant in that they corroborate what Dr. Titus has brought out, that relief of dehydration and the feeding of glucose are very important things to resort to in severe cases where we are afraid of embarrassing the cardiovascular circulation by the intravenous

method. The fluid is thrown into the circulation and gradually picked up just as the patient needs it, by being absorbed slowly by the peritoneum.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—The instrument devised by Dr. Titus is as nearly perfect for injecting glucose as anything I have ever used. It saves the time of the nurse and doctor and is absolutely accurate.

Where the ambulatory patient shows a deficiency in urinary output, with rise of pulse rate and loss of weight, we should hospitalize the patient, give her the necessary quantity of fluid to produce diuresis and emptying the uterus will not be necessary. We have not done a therapeutic abortion for vomiting in over nine years. Furthermore, I want to say that the fear of producing insulinism is an overestimated danger. I have always felt, as Dr. Titus has stated many times, that nature was competent to take care of the excess of glucose and the excess is excreted in the urine.

The other point is in regard to Dr. Kellogg's paper. I do not know what is the matter with Boston women. Perhaps their toxemias are more severe than those found in our Brooklyn women for we are not having such hopeless results as a 20 per cent mortality in eclampsia. I agree absolutely with his classification. It should be adopted in order that we may study these cases and properly group them; we owe it to the woman to be able to tell her ultimately whether she should never become pregnant again and should be sterilized. We owe it to society to tell these people that they are bearing a child at the cost of kidney damage and chronic nephritics should be sterilized.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—A few words should be offered regarding the classification of the so-called nephritides. These remarks are fitting because within this year at Minneapolis there was held a very notable conference upon the kidney and its diseases. At that conference Vollhard of Frankfort-am-Main, Rethberg of Copenhagen, Snapper of Amsterdam, and representatives from many universities in this country devoted a continuous period of about twelve days to discussion of the problems of the kidney. There was lack of agreement concerning the nomenclature of certain phases of kidney pathology, particularly the so-called chronic nephritis and nephrosis cases. These terms were used almost interchangeably. Nephrosis means a degenerative change, in most instances beginning in the tubules of the kidney but not strictly confined to the tubules. We are in the habit of speaking of degenerative changes and calling them inflammatory. It has been claimed in certain statistics, that an acute glomerular nephritis is rarely recovered from, and yet we speak and write frequently of chronic nephritis and we define this disease as being caused by repeated acute inflammation of the kidney. Others say they are acute manifestations of degenerative changes occurring at different times. Now, I am of the opinion that a classification must be agreed upon to define these pathologic conditions by terms common to all.

Bell of Minneapolis has shown by specific staining methods, using azar-carmine, that glomeruli in an acute nephritis have their capillaries narrowed but not closed; in the chronic type the capillaries are closed. The stain will distinctly differentiate the stroma, the endothelium, and the epithelium, and one sees in these so-called chronic nephritides the closed capillaries in very many of the glomeruli. These changes are called inflammatory lesions and also degenerative lesions. Which are they? Judged by criteria applied in pathologic changes in other tissues, they are distinctly of degenerative character. But it is possible they were preceded by inflammatory changes yet there are usually insufficient data present for the recognition of a previous or active inflammatory change.

DR. E. D. PLASS, IOWA CITY, IA.—I still believe that the pernicious vomiting of pregnancy is essentially a neurosis. I have yet to be convinced that there is

a carbohydrate deficiency. I treat my patients as if they were neurotics and do not empty the uterus, and I lose very few patients. I do recognize, however, that there is a type of pernicious vomiting which if not toxic at the beginning develops toxic properties and leads to the death of the individual. I am frank to confess that I do not know how to differentiate those few individuals who will die. Early deaths in my experience have been uncommon but recently I have seen three patients die six or eight weeks after apparently complete control of what was, we presume, neurotic vomiting, because it responded to neurotic treatment with cessation of vomiting. These three patients all behaved very similarly. There was in each case some reason why they did not desire the pregnancy to continue, an essential factor, I believe, in the majority of cases of hyperemesis gravidarum. They were hospitalized, were not given glucose, but within a week or ten days had recovered to the point of eating full-sized meals and of resuming their activities, and were discharged from the hospital. Each of these individuals, between six and eight weeks from the time of discharge, returned in a moribund condition. The picture was that of a slight mental disturbance, a slight return of the nausea, never marked, no evidence of emaciation, no clinical or laboratory findings of note.

Two of these patients came to autopsy. In neither was there any lesion which the pathologist could offer as an explanation of death. There was no liver necrosis, although there was fatty degeneration of the liver. In one case there was a small kidney with some evidence of chronic nephritis. In the second instance there was a large kidney, more typical of the nephroses. We do not know yet how to classify those patients. They were not vomiting at the time of death, had none of the signs that we ordinarily associate with vomiting, and yet they had developed fatal symptoms a month and a half or two months after control of the initial attack of vomiting. In that connection I would like to ask Dr. Van Wyck what the pathologic picture is in the vomiting of pregnancy? The experience of all of us has been, no doubt, somewhat limited. I, personally, have seen but one patient die with vomiting of pregnancy who showed the textbook picture of central necrosis of the liver lobule, acute yellow atrophy of the liver.

DR. W. W. BABCOCK, PHILADELPHIA, PA.—Speaking rather apart from a chemical toxemia and referring more particularly to cases in which there is an infectious element, one wonders if by the introduction of saline solution into the blood possibly an impairment in function may occur. We know how innocuous physiologic salt solution is in the normal peritoneal cavity, but it has been very clearly shown that salt solution in contact with inflamed peritoneum interferes with phagocytosis or the defense reactions of the peritoneum so that peritonitis is rendered more dangerous. So one cannot help but wonder whether after the introduction of large quantities of fluid into the blood stream, if the blood will be as potent in combating infection as it would without the admixture. Venoclysis should aid elimination in toxemia, does it reduce the bactericidal and antitoxic properties of the blood? I shall be glad to hear this question answered. In any case we should not forget the older and simpler method of introducing fluid under the skin. It is quite possible by hypodermoclysis to introduce 4000 to 8000 c.c. of salt solution containing from 2 per cent to 5 per cent glucose daily, and to continue this for five or six days. Of course, if the glucose or dextrose is in concentration irritation may be produced. From the subcutaneous tissues the salt solution enters the blood stream as blood serum and may thus maintain the more effective qualities of the blood in the presence of infection.

DR. H. B. VAN WYCK, TORONTO, CANADA.—The question of neurotic as against toxemic vomiting is something more than a mere academic thing. It profoundly influences our treatment. Dr. Plass's two patients died of starvation and de-

hydration. One wonders whether a fatal case of starvation need always have the same pathologic picture. Our experience with similar cases is fortunately limited. We have had in the metabolic ward in the last eight years two fatalities from hyperemesis, in both of which we were at fault as we did not recognize the urgent indications. In one of these the autopsy showed a centrolobular necrosis. The idea is distasteful to me that the patient can go to a fatal termination from the pure neurosis. An analogy springs to my mind. A patient with appendicitis is put to bed and recovers and because we cannot demonstrate tangible pathology, are we justified in saying that the case is one of neurosis? That may be a poor analogy but as some one has said, "When an analogy is perfect it is no longer an analogy but the thing itself." We must remember the essential definition of neurosis; that it is a condition which is amenable to suggestion.

With regard to what Dr. McConnell showed us about venoclysis, I feel that it justifies us in still further examining our methods of intravenous therapy. We felt that we were using the largest amount that was practicable. One might question the comfort that a patient would have with a cannula in the vein over a long period. We find such a patient sometimes gets very restless and requires morphia. At any rate we shall certainly try to increase the amount of fluid and glucose that we are giving. I feel that the ordinary Murphy drip or the burette method is to be commended rather than the more complicated apparatus.

I am also grateful for the suggestion of amytol, which will make it possible to prolong the administration of glucose.

DR. McCONNELL (closing).—The only discomfort complained of by these patients was in the arm. They are usually very restless. Most of the women in whom this method was used were seen in consultation late and, as Dr. Titus brought out, if the patient is treated properly during the early manifestations there is seldom any need of radical treatment. Very frequently one dose of glucose solution will be sufficient. In none of these cases where we used the continuous drip did we do so without having first tried the intermittent method.

In a recent case which did not respond to the dosage method, having severe reactions with each injection, although it was being administered very carefully, we attached this apparatus. Although going for three days, she showed no reaction or ill effects.

We saw two cases of insulin reaction where we had added insulin to our solution purely for experimental purposes. When the insulin was discontinued, the reaction disappeared and did not return. I think the insulin bugaboo is very much overrated, especially when the solution is administered very slowly and the rate kept so that the body can take care of it.

My principal object in undertaking this study was simply to determine the relative relation between the rate of injection of glucose and the variation in blood sugar resultant therefrom.

DR. KELLOGG (closing).—Especially interesting in the light of Berman's "cardio-vascular deficient" group, of which I have spoken, is what Dr. Davis said about so-called nephritis being a nephrosis and part of a general vascular degenerative picture. The time will come when we will need intimate nephritis and nephrosis distinctions for the perfection of our ultimate classification. With Stander, I agree that this time has not yet arrived.

At present we must view this problem of saving lives in the toxemias as the figures dictate. Except for small or selective series, these figures are 2.5 per cent maternal mortality for toxemia without convulsions and 25 per cent for toxemia with convulsions. This means only that, broadly speaking, the convulsion is an index of the severity of the underlying condition, not that the convulsion per se kills.

There is little question in my mind that eclampsia and toxemia differ in amount and quality in different countries and in different parts of the same country. The Eden classification, I believe, represents practically a prognosis from the autopsy table backward. Therefore, if you select cases according to this classification the mortality should be nil, whereas it is 2 or 3 per cent, showing that even that way prognosis is difficult. Our mortality in Massachusetts shown in a personal study of twelve hundred cases in three groups of 400 each is 25 per cent, 24.8 per cent and 50 per cent respectively, the first two in our own hands. The tabulated mortality in Stander's monograph of over 10,000 cases, by different authors, shows that, barring the Stroganoff series already spoken of, the shorter the series the better the mortality by both conservative and radical treatment. For instance, Dorsett with 38 cases reports a mortality of 5.3 per cent by the magnesium sulphate treatment. If my memory serves me, when his series was in the sixties, his mortality was about 9 per cent. I do not know what it is now but expect it will be higher with a further accumulation of cases. In any large series the mortality approaches 20 per cent and this in hospital practice by good obstetricians. It requires no imagination to think what it is outside of the good hospital. Therefore, because the momentary treatment of eclampsia appears so successful in Chicago, Brooklyn, Atlanta, Los Angeles, Pittsburgh, or Russia, I see no reason to change the opinion here laid down, namely that saving lives in toxemia depends chiefly on preconvulsive interference.

Some Observations on the Menstrual Disturbances of Adolescence,

by DR. E. D. PLASS, Iowa City, Ia. (See page 205, February issue.)

DISCUSSION

DR. D. L. JACKSON, BOSTON, MASS.—Investigation into the field of causes and controls of the female sex cycle is opening new fields of probability and supposition daily. It gives those of us who work mainly on the clinical side, possibilities of treatment, hitherto unsuspected, not only in dysmenorrhea and amenorrhea and menorrhagia, but in the general development of the adolescent girl, sterility in the young woman and comfort for the older woman in the menopause.

At the present time research in this subject seems to center in the triumvirate of glands; the ovary, the pituitary body, and the thyroid gland. All seem to have a part to play in the female sexual and menstrual cycle as well as in the development of the woman from the girl.

Treatment by ovarian extract or by the follicular hormone derived from the corpus luteum seems to have been a disappointment and amounts to nothing save in women at or beyond the menopause. On the other hand, thyroid extracts and extracts or hormones from the pituitary body seem to exert great activity in the control of the sex cycle during the adolescent and reproducing period of life, particularly in the former. Difficulties are apparently more on the hypo than on the hyper side of the activities of these glands. The basal metabolic rate gives us an absolute measure of the activity of the gland in thyroid disease. This must be checked with physical findings and laboratory tests. No case of hypothyroidism sufficient to cause menstrual disturbance will fail to give a lowered basal metabolic rate. It must be remembered that the reading of a single basal metabolic rate test is not conclusive of the true rate. The patient must be accustomed to the test, as it is found that nervousness or excitement easily pushes a rate up ten points. Slightly lowered basal metabolic rates will also be found in pituitary disturbance (Cushing), in surgical castrates and in patients with a negative nitrogen balance; viz., a really low basal metabolic rate—minus 20 to minus 40—is thyroid,

but a minus 10 to minus 20 rate may be due to other causes. According to Lawrence and Rowe, we seldom get menorrhagia in hypopituitary disturbance but we do get disturbances of periodic variation and of the amenorrheic type. Dr. Plass found both amenorrhea and menorrhagia in cases of slightly lowered basal metabolic rate. If, in this series, some of the lowered basal metabolic rates were due to one of the reasons stated above, other than thyroid insufficiency, it would very likely account for the good results obtained with the administration of thyroid extract in menorrhagia and the indifferent results found in amenorrheic cases. In other words, the question of the true basal metabolic rate becomes most important in the nearly normal cases, and it is in these cases that the clinical side becomes of greatest help and must agree with the laboratory findings.

In regard to the pituitary gland and the effect of its secretions on the menstrual cycle, I cannot agree with Dr. Plass on the measurement of the sella as giving an indication as to the size of the pituitary gland. The sella itself can be measured with great accuracy but I am told by Dr. Sossman, who has charge of the x-ray department for Dr. Harvey Cushing at the Peter Bent Brigham Hospital, Boston, that the relation of the gland to its seat is in no wise a constant or accurate estimate. Dr. Plass also postulates that in adolescents the size of the gland is in relation to its activity and to this I must again take exception. For example, the thyroid of adolescents frequently enlarges, apparently an attempt on the part of the gland to supply a deficiency, but this in most cases results only in hypertrophy of the gland tissue without increase in secretion. In cases of pituitary disease we must combine our laboratory results with a careful history and physical examination to make the diagnosis and eliminate other possibilities, as we have no definite test to rely on as in the case of the thyroid gland.

DR. A. J. RONGY, NEW YORK CITY.—In each generation, it is authoritatively stated, there is about 12 per cent of marriages that are sterile. About 6 or 7 per cent of these cases are caused by definite inflammatory and infective processes of the genital tract. A small per cent of these sterile marriages are caused by neoplasm and malformation. However, 3 to 4 per cent of this group of patients are sterile because they have reached the limit of reproduction and are unable to procreate. This may be one of nature's ways of limiting the population. These patients fail to respond to any treatment, and remain permanently sterile.

Now, if we keep this point in mind, we will find that some of Dr. Plass's patients indicate that type of sterility. Since the onset of menstruation, the menstrual function in such patients is disturbed. They either have a scanty, irregular menstruation, or sometimes the reverse happens: they begin to bleed and the bleeding continues irregularly for over a period of weeks. A great number of these patients when they marry, are sterile. Such cases are a source of annoyance to every gynecologist, because he finds himself perfectly helpless to correct the constitutional disturbance, which results in irregular menstruation and low grade of fertility.

However, some of these cases, for a reason yet unexplained, respond to the treatment with small doses of x-ray. It is remarkable how, in some of these patients who have not menstruated for months and years, the menstrual function is reawakened and they begin to menstruate regularly after five or six such treatments. We have as yet no way of explaining the effect of the small dosage of x-ray upon the ovaries in these patients. Still, clinically we know that it must have some effect on the ovarian structure.

A few of these patients even become pregnant after a long period of disturbed menstrual function and sterility. I made a preliminary report of this type of cases before this Association three years ago. Since then I have treated a great many more patients and the results have been very encouraging.

DR. E. P. SLOAN, BLOOMINGTON, ILL.—Sixteen cases in fourteen families that were between the ages of fifteen and twenty-two years came under our observation in 1925 and 1926. Correction of their thyroid deficiencies has apparently been productive of much improvement in their general health, but their menstrual disturbances have not been markedly influenced. The average age at which menstruation appeared in fifteen of these girls was seventeen years and three months. One with an infantile uterus is not menstruating at twenty-two. After more than three years of careful treatment seven out of the fifteen have severe pain at the menstrual period only occasionally instead of severe dysmenorrhea every month. In the other eight cases any apparent improvement in regard to pain and disability that has occurred has been temporary. We attribute our disappointing results in these cases to the age at which their thyroid deficiencies were corrected.

We have studied twenty-four younger sisters of these girls, nineteen of which showed definite symptoms of hypothyroidism. Of these nineteen, nine were under eleven years of age, six were eleven to twelve years of age, and four were thirteen years of age when thyroid therapy was instituted. All those in this group in which the thyroid deficiency was corrected before the age of thirteen are now menstruating normally. The average age at which menstruation appeared was thirteen years and one month.

If the symptoms in these cases are due to retarded differential development of the uterus and ovaries from hypothyroidism, then it is obvious that we usually see the case too late to speed up differential development with the whip of thyroid therapy. It does no good to whip the horse after the race is run. The hypothyroidism in these cases is usually of only mild degree and for maximum results the diagnosis must be made before obvious symptoms appear. Considerable difficulty may be encountered in making an early diagnosis.

The basal metabolism test is of little assistance but, as Dr. Plass has suggested, valuable information may be derived from x-ray studies of the stage of development of the bones. But the diagnosis in the majority of cases must rest upon the personal and family history and physical examination.

DR. PLASS (closing).—I should perhaps explain that our postulation regarding the relationship between the size of the hypophysis and the sella turcica in adolescent girls was developed after we had adduced the evidence of such relationship here presented. We have not attempted to go beyond the correlation which we have shown and which is given to you for what it is worth.

In this report first metabolic rate readings were not used, all figures refer to second or third determinations.

I would also emphasize that we are dealing entirely with young girls. Whether there is any relationship in older women, with already established menstruation, between the amount of the menstrual flow and the size of the sella, I cannot say because we have limited our work to girls in the adolescent period.

The Present Status of Tubal Insufflation With a Description of a New Method, by DR. Q. U. NEWELL, St. Louis, Mo. (See page 414, March issue.)

DISCUSSION

DR. ALEXANDER M. CAMPBELL, GRAND RAPIDS, MICH.—A few years ago we looked up in our clinic the statistics, to determine the frequency of tubal obstruction in sterility. These figures were somewhat controversial in nature and they varied from 25 to 70 per cent. Douay states that indisputable permeability occurs in about 25 per cent of all cases of sterility.

I am pleased that Dr. Newell has suggested his ingenious idea of tubal insufflation following reparative tubal surgery because it attracts attention to the

possibility of reconstructive surgery of the tube. I believe that we are on the threshold of some very definite achievement in the way of restoring fertility to a number of women whose fallopian tubes are impermeable and who are because of it, hopeless cases.

Dr. Newell's suggestion of the employment of a delicate technic in doing tubal surgery is most timely and I believe that gynecologists within the near future will with the development of a proper technic and with proper study of their sterility cases be able by reparative surgery to restore a considerable number of otherwise hopeless cases to a state of fertility.

DR. A. J. RONGY, NEW YORK CITY.—I should like to know the number of cases of tubal obstruction operated upon and the results of these cases two or three years later. Some of us in New York feel that plastic surgery on the fallopian tubes to cure sterility is becoming a bit useless and is gradually given up. In the best of hands there is a 10 per cent cure. If this is true, then a very serious question arises. Given 100 women, subjected to operations for the reconstruction of the closed fallopian tubes, the result will be as follows: 10 per cent may be cured, 90 per cent will have permanent closure of the tube, with no chance whatsoever of the tubes ever becoming patent. If these women were let alone, the chances are that in a great percentage of these patients spontaneous regeneration of the fallopian tube would take place and they would become patent. Spontaneous regeneration of a fallopian tube seldom takes place after plastic surgery has been performed on the tube.

DR. W. A. COVENTRY, DULUTH, MINN.—I think it is very important that a second picture be taken from one to twelve hours after the first picture in order to determine whether the lipiodol which has accumulated in the fimbriated end of the tube leaks through the tube and therefore causes the so-called splash in the pelvic picture. In my opinion, it is very hard at times to determine whether the tubes are really closed at the fimbriated end or whether just the lipiodol is retained in the fimbriated end when the first picture is being taken. The second picture will, as a general rule, confirm the diagnosis.

DR. NEWELL (closing).—In regard to Dr. Schmitz's remarks about the second hysterosalpingogram three months later, I think his suggestion is an excellent one. My routine has been to make a hysterosalpingogram before operation in order to locate the tubal obstruction and fourteen days after the operation for the relief of the obstruction, I make a second hysterosalpingogram, then follow my treatment with gas insufflation tests from time to time in order that the tubes will remain patent.

Recently, I have had the good luck of examining the fallopian tubes when the abdomen was opened in two patients on whom I had performed plastic work for tubal obstruction and found the tubes in both cases patent and in good condition.

Some one suggested taking a second picture twenty-four hours after the first one. Occasionally I do this, but only in cases where the interpretation is not clear. I do not see any particular reason for doing it routinely.

Matin Sleep, by DR. GEORGE F. CHANDLER, Kingston, N. Y. (See page 285, February issue.)

DISCUSSION

DR. E. M. STANTON, SCHENECTADY, N. Y.—I suppose that practically everyone who has listened to this paper and has not himself used the method described by Dr. Chandler has had more or less skepticism. Early in the spring when

Dr. Chandler told me what he was doing, I went down to see a few of his patients. I went in a skeptical frame of mind, but when I got home I began using it in a few cases and then more frequently, until it has gradually become practically a routine procedure with me. We give ten grains of luminal at 9 P.M. the night before operation. I use ethylene in the place of nitrous oxide. It has had a very marked effect on the number of spinal anesthetics that we give. I like to use spinal anesthesia but I feel that there is a great deal more mental hazard for the patient under spinal than under an inhalation anesthesia. With the luminal, it is much easier to give ethylene or ether and I am not using nearly as much spinal anesthesia as I did six or eight months ago.

DR. CHAS. GORDON HEYD, NEW YORK CITY.—In the consideration of anesthesia, and Dr. Chandler's presentation of matin sleep, we are apt to forget that surgical anesthesia embraces two separate and distinct features. There is first the phase of analgesia in which the pain sense is obliterated, and secondly, the phase of narcosis. It is not necessary to have narcosis in order to have analgesia, nor does narcosis imply an analgesia. In local anesthesia the pain sense is obliterated yet the mind is perfectly clear and capable of being traumatized in direct proportion to the stimuli that reach the brain. Dr. Chandler's contribution is of distinct value because it brings to surgical analgesia a therapeutic procedure that is capable of putting the brain to sleep and thereby protecting the patient against the sum total of all stimuli that reach the brain.

We have utilized at the New York Post-Graduate Medical School and Hospital a variety of preoperative narcotics: allonal, luminal, amytal, and sodium amytal both orally and intravenously. We have used the preoperative narcotic for practically every type of anesthesia, local inhalation, intravenous, and rectal. We are firmly convinced that the placing of a patient about to undergo a surgical operation in a semi-narcotic condition before the administration of the anesthesia protects that patient in many ways and that the postoperative convalescence is easier and smoother than for patients who have not been so treated.

In regard to Dr. Wetherell's remarks about spinal anesthesia, we are convinced that there are some patients who do not take spinal anesthesia well. The anesthetic agent is delivered into the spinal canal yet these patients exhibit such a high degree of mental irritability that pressure anywhere in the area of the field of operation is misinterpreted as pain and the anesthetic course of the case is not successful.

DR. ARTHUR H. BILL, CLEVELAND, OHIO.—We have been following a similar principle in obstetric cases. One of the problems, especially in a multipara, is that of a continuous relief of nervousness and of pain. Where administrations of an analgesic are given with the labor pains, there is such an interrupted performance that the patient is more or less conscious between pains, has a fear of going under the anesthetic and is somewhat conscious of the labor. We have been using for some time a method similar to Doctor Chandler's. It just happens that the preparation we have been using is amytal. At the present time this is our routine with multiparae. At the very onset of labor, the multipara is given from 7½ to 10 grains of amytal. This quiets her but does not entirely control the pains. However, it makes it possible when the pains are harder, to relieve the suffering entirely and have a period of somnolence between the pains, so that there is a continuous analgesia enabling the patient to go through all stages of labor and at the end of the labor have practically no consciousness of the entire proceedings. I said that we do this routinely only with the multipara because we still cling to the morphine and scopolamine method in the primipara, and find it most satisfactory.

DR. A. M. MENDENHALL, INDIANAPOLIS, IND.—In Indiana we are using sodium amytal, very much as Dr. Chandler has recommended using luminal. Practically all the general surgeons are now giving sodium amytal in a 3 grain dose the night before operation, and in the morning one or two hours before the operation they are giving 6 grains of sodium amytal. It very satisfactorily prepares the patient for a general anesthesia later.

DR. JAMES E. KING, BUFFALO, N. Y.—Those of us who are confining our surgery largely to women have two distinct anesthetic problems to consider. The first is the choice of anesthetic which will make it possible to conduct our operation satisfactorily; the second, an anesthesia that minimizes the preoperative mental reaction. I have been through the stage of spinal anesthesia and have rejected it, except in certain cases. I have never had the faculty of talking my patients into a quiet state of mind or continuing the conversation during the operation as many men who use spinal anesthesia are able to do. I have been on the lookout for some satisfactory method by which the patient would have less fear preceding and less disturbance after the operation. Recently I have taken up avertin. We have, at the General Hospital, done nearly 500 cases with this drug and, personally, I am convinced that it has great possibilities. In my own series I have only had about 150 cases, which embrace most of the operations in gynecology. It has been extremely satisfactory, not only from the operative side but especially because of the pleasant remarks that the patients make in regard to their experience.

DR. W. W. BABCOCK, PHILADELPHIA, PA.—Dr. Chandler has emphasized the synergistic action of luminal when used as an adjuvant to other anesthetics. Used alone for the production of anesthesia the barbiturates produce such prolonged periods of coma that the patient is very prone to develop secondary bronchial pneumonia, hypostatic congestion, and an increased tendency to thrombosis. In The Mayo Clinic where these drugs, and especially sodium amytal, have been used quite extensively during the last few years in an experimental and clinical way these complications have necessitated postoperative massage and frequent change in the patient's position. It is evident that the barbiturates should not be used as pure anesthetics.

To many hypnotic drugs the young patient reacts with delirium, the elderly and toxic patient with coma. Thus from amytal or luminal one patient becomes widely delirious, another stuporous. The liver is the great detoxicating organ of the body. If it functions badly as in old age then the physiologic effect is modified. It is evident that these drugs should be used with care in the senile, septic, or toxic patient. As Dr. Chandler has mentioned, we should use these drugs only as adjuvants to aid in the production of anesthesia. Doses sufficient to cause prolonged stupor should be avoided. I take it that Dr. Chandler reduces the large doses mentioned for the substandard patient. Obviously intravenous anesthesia has not yet been rendered safe and I am glad that Dr. Chandler does not recommend it.

DR. CHANDLER, (closing).—In reply to the question about morphine and scopolamine or atropine, I do not give these drugs at all, just the luminal.

I have used sodium amytal, intravenously and by mouth, and had an unfortunate fatal result with it intravenously.

The Sedimentation Rate in Gynecology and Obstetrics. Results of Three Thousand Tests on One Thousand Patients by Recent Modification of Westergren's Method, by DR. ALBERT MATHIEU, Portland, Oregon. (See page 197, February issue.)

DISCUSSION

DR. F. H. FALLS, CHICAGO, ILL.—From a study of this apparatus I think it commends itself first because of its simplicity and convenience, secondly because one is able to begin readings and complete them in forty-five minutes. It is also valuable because the tubes are of a type that can easily be cleaned.

As to the value of the sedimentation test, I think Dr. Mathieu has pointed out certain things that are of great importance; in the first place, the observation that there was an increase in sedimentation time in retention of membranes without infection. Naturally this limits its value for a clinician who is looking for evidence of infection. In differential diagnosis of carcinoma of the cervix and simple erosion of the cervix it would be very simple if this test showed an increased sedimentation rate in carcinoma of the cervix and not in erosion. We have tried to stress that point in our investigations, but we found that minor pathologic conditions will increase the rate just as much as a carcinoma will. A tonsillitis or a chronic tubercular ulcer will increase the rate. Therefore, in the case of differential diagnosis between simple erosion of the cervix and carcinoma of the cervix, one would have to be very careful that there was not some other factor that would increase the sedimentation rate so that it might be interpreted as carcinoma.

In our series of cases we have noticed an increase in the sedimentation rate does not occur early in postoperative complications. That is, there may be a delay in the appearance of the increased sedimentation rate after the clinical evidence of the peritonitis, or other postoperative complications, has been present for several days. In other words, there may be a delayed reaction. Manifestly in this case, it would be of no clinical value.

DR. W. E. DARNALL, ATLANTIC CITY, N. J.—I confess that when this sedimentation test was first brought out I was somewhat skeptical about it, but in the last two or three years, in our gynecologic work particularly, we have been making a sedimentation test routinely and I think the more we study it the more we realize its importance.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—We have done some 6000 tests by the Friedlander method. We have tried to keep this test out of the laboratory and have taught our students and residents to do it, believing it to be of more value when associated with the clinical story, just as we do with the blood and urine than it is to allow it to be distinctly a laboratory procedure. It is not diagnostic, but when it is correlated with the story of disease and the picture of disease it is a very helpful diagnostic method to determine the presence or absence of infection.

Dr. Falls did not bring out clearly to my mind one point. Dr. Mathieu noted that the sedimentation time was more rapid in cases of retained membrane even when there was no infection present. This is a very important thing to remember because we use this test to determine when to empty the uterus of retained material and unless the sedimentation time becomes longer and longer the woman has not protected herself against the infection and until protection is established on the part of the patient we do not want to increase her danger by opening up the sinuses of the uterus by curettage.

DR. H. W. YATES, DETROIT, MICH.—In our series of cases, about 1550, we have used the ordinary early type of the Friedlander technic. We found that when we left this in the hands of our interns it was very likely to be faulty, and was never dependable. We used it in about 80 cases at first and found variations in the leucocyte count and the operative findings so that we could not depend upon it. After reading papers recommending it we again used it on 150 patients and

were again disappointed. I could not help but feel that there was something wrong with the technic, therefore we had these tests done entirely in the laboratory, under the strict supervision of a technician, and then we began to find that we had some definite results.

We have found in our series of cases, carrying out the impression of the essayist, that it is very much more dependable than the blood count. When we have found in many instances that the clinical findings are those of normalcy and the leucocyte count likewise normal, we have operated in spite of the sedimentation test showing an infection and in those cases we found we should have gone according to the sedimentation test rather than the clinical and blood findings.

DR. L. A. CALKINS, KANSAS CITY, KAN.—We have been using the sedimentation test routinely for four years and have not operated upon any salpingitis case until the sedimentation time was less than 20 mm. in one hour. We believe that we could use a fifteen-minute test with just as great advantage as the one-hour test. We should not, however, forget that the sedimentation test is not reliable in anemic patients. The greater the anemia the greater the degree of sedimentation from the anemia alone, so that in those patients we must correct for the anemia.

I would like to repeat again that this test is not of any value in a differential diagnosis. It does, in a measure, indicate the presence of infection but its real value is in determining the time of operability, and we believe it is worth more than temperature, pulse, white count, and the Simpson test all combined.

DR. MATHIEU (closing).—To me the important points in the paper are the facts that one blood specimen is sufficient for all the blood studies; and that the technic described is perfectly reliable for sedimentation distance readings.

As to the cause of the sedimentation phenomenon, the work done to date would lead us to believe that in the presence of infection or inflammation, there is a marked increase of the fibrinogen content of the blood plasma, and we think that this fibrinogen is poured out by the liver. At any rate it has been proved by Weiner of New York that there is a marked increase of the fibrinogen content of the blood plasma in infection and inflammation.

These points all lead us to wonder why the pregnant woman shows such a marked continuous increase in the sedimentation distance of her blood. This takes place practically as an arithmetical progression. My opinion is that as the pregnancy increases in time so does the size of the placenta increase; so do as a rule, the number of infarcts increase and so does also the probable infection of the placenta and so do also the number of syncitial buds that may gain access to the maternal circulation.

Postoperative Abdominal Fistula, by DR. J. F. ERDMANN, New York City. (Will be published in the current volume of Transactions.)

Choriomas—A Clinical and Pathologic Study, by DR. HENRY SCHMITZ, Chicago, Ill. (See page 256, February issue.)

DISCUSSION

DR. JOHN O. POLAK, BROOKLYN, N. Y.—Dr. Schmitz's classification is a little further advanced than the one Ewing brought out many years ago and which has been the standard classification in this country from that time on.

The surprising thing about this condition is the statement in almost every textbook as to the incidence of the occurrence following hydatidiform mole. The cases of chorionepithelioma which we have seen have all followed a full-time pregnancy or premature labor. We have never seen a case of chorionepithelioma follow

a hydatidiform mole. A recent check-up of our hydatidiform mole cases disclosed between 40 and 50 in the last ten years. Incidentally, we have a 92 per cent follow-up in our clinic. We instruct every woman that if any bleeding occurs after discharge from the hospital she must report back. The result is that we find this bleeding is usually due to misplacements or a subinvolution and if corrected, with a pessary or with the use of ergot, quinine and strychnia, the bleeding is promptly stopped. The incidence, therefore, of hydatidiform mole being followed has been nil so far as chorionepithelioma is concerned. We have at the same time seen ten of these cases occur as the result of a previous pregnancy and delivery, some in very young women. There were two in which the first evidence was shown in an attack of pleurisy without any history of bleeding whatsoever and on tapping the chest made a diagnosis from the cells that were found. Ordinarily these people present a story that is rather consistent; they persistently bleed, yet their pallor is out of proportion to the blood loss. It is a cachexia and skin appearance that is out of proportion to their actual blood loss; the cervix is almost invariably open.

One other very interesting case was diagnosed as an ectopic. The chorionepithelioma had passed through the uterine wall and the patient had an intraabdominal hemorrhage which simulated the picture of ectopic with the attack of pain and anemia.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—One should not depend upon a diagnosis that is rendered from a very small or scant specimen obtained by curetting the uterus, as no pathologist can offer a diagnosis of any value. To secure biopsy material that is worth while, the curettage must be thoroughly done to secure a specimen from the area suspected and which will extend beneath the epithelial layer. In other words, it is exceedingly important that the microscopic material shall include enough tissue so that the area examined will display both normal and involved tissues. A comparison of the involved and uninvolved areas is of great value.

It is necessary to consider trophoplastic tissue in relation to its problem of differentiation. What is the ultimate outcome of its differentiation? Normally it is essentially just trophic material. A hypertrophic change may be due to an increased blood supply or to irritation, which of course brings about an increased blood supply. This change should not mislead one and be regarded as malignant. The malignant trophic change means that the cells have become differentiated in such a way physiologically and anatomically that there is a change from the normal. Anatomically the cells have become unlimited and grow beyond the basement membrane or the area they should occupy during existence as normally functioning cells. The latter are not out of control of their cellular laws.

The atrophic type of change in trophoplastic tissues is frequently spectacular. When metastasis has become widely disseminated, deactivation of the trophoblastic tissue may suddenly occur, and atrophy follows. It is well known that this occurs simultaneously or directly after the uterus has been emptied. What is the deactivating substance produced, and how does it produce a reversal of the growth? Has this low grade germ plasm been deprived of an optimum condition for its development, and was this resident in the uterus as a parasitic hormone which when reduced in quantity reached impotency? Its action appears different from Fleming's lysozyme.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—We found in 150 Aschheim-Zondek tests that for several days following pregnancy or miscarriage this test was still positive, although we have seen no cases of hydatidiform mole or choriomas since we started this work. I would like to know what Dr. Schmitz's experience has been. We feel that in a case of chorionepithelioma the reaction should be positive

and that in hydatidiform mole there would be a similar reaction. In fact it has been shown that the reactions in cases of chorionepithelioma and hydatidiform are so strong that a positive reaction can be gotten by using one-tenth of the amount of urine that one would ordinarily use and that on the strength of a positive test with this dilution diagnosis of chorionepithelioma or hydatidiform can be made.

DR. SCHMITZ (closing).—Fortunately all of these cases were operated upon after the microscopic examination of tissues removed from the uteri. One of the cases treated with radiations had an enormous extension of the chorionepithelioma into the vagina and an excision was made for diagnosis. In the other case treated with radiations the entire ovum and tumor were expelled and thus microscopic diagnosis could be made.

The diagnosis of choriomas offers many difficulties and errors in diagnosis are frequent. This is the reason for the division of the clinical varieties into benign and malignant, stating the histologic characteristics for each group in an early, comprehensive and simple manner, and basing the indications for treatment on this classification: namely, the benign choriomas are self-limited, usually detach themselves completely from the maternal tissue and are expelled in toto. Should hemorrhages recur, then curettage must be done. The malignant choriomas indicate hysterectomy, even if metastases have formed.

Applying radiations after operation to prevent recurrences or to kill vestiges of tumor tissue that may have been left behind or may have been spilled during operation will improve the percentage of good end-results.

We had three cases of placental moles, two simple and one invasive. They were accompanied by the most profuse hemorrhages we have ever observd. One woman was thirty-five years of age. She had been discharged from the hospital three times with the diagnosis of pregnancy. She returned to the follow-up clinic while bleeding. A vaginal hysterectomy was done and a placental mole was found. One other patient was forty-eight years old. A diagnosis of carcinoma of the body was made. Vaginal hysterectomy was done. Microscopic examination revealed a placental mole. It shows how very careful one should be in making diagnosis without corroboration by microscopic examination. These three patients would have been saved from hysterectomy had a frozen section diagnosis been made before operation. Unfortunately the hospital did not have these facilities and one was compelled to rely on the clinical evidence which justified the procedure.

Abstract of discussion of Dr. Jones's paper on **Cancer of the Cervix.**

(For discussion, see page 187, February issue.)

DR. WM. SEAMAN BAINBRIDGE, NEW YORK CITY.—While this contribution sheds indeed a hopeful and optimistic light on the action of radium in early cancer of the cervix, the contents of the paper do not bring out the comparison, indicated in the superscription, between the results of surgery and of radiation. A justifiable tendency is often found, on the part of contributors in various fields, to rely on the discussion for bringing out the necessary data on the other side of the line of argumentation. Moreover, many have questioned if an actual, fair, and just comparison is practicable in these circumstances. More or less insuperable difficulties are found here, for in behalf of surgery, it is imperative to take into consideration the operability of the patients, the stage of the disease, the time of the intervention, the condition of the pelvic glands, the immediate or operative mortality, the length of survival rates, the results some years after treatment, etc. The gathering of comparative data from the literature provides no feast, but a

veritable famine of figures on which a truthful and instructive comparison can be based. The whole subject at the present time is still, as it were, in chaos.

My own experience inclines me as yet in favor of surgery in operable cases, with or without some form of heat: and from this viewpoint I shall endeavor to supplement the information conveyed in the Cleveland paper. It is noteworthy that even a convinced adherent of radium, like Dannreuther, concedes that in spite of encouraging statistics from the Radium Institutes in London, Paris, and Stockholm, many Continental gynecologists are still enthusiastic advocates of radical abdominal hysterectomy. Weibel in Prague, Warnekros in Dresden, Faure in Paris, and Bonney in London, have done a very large number of these operations, and each one claims a primary mortality of less than 8 per cent, with a very satisfactory number of five-year cures.

DR. HENRY SCHMITZ, CHICAGO, ILL.—If the results of radiation therapy are the same as those of surgery in the clearly operable cases, i.e., the incipient nodular stage, then one must agree that both methods of treatment are standard. Statistics of good end-results of treatment show conclusively that radiation therapy gives equally good results as surgery in cervical carcinomas. The former has the advantage of a negligible mortality and morbidity after treatment in comparison to those of surgery.

The question then simmers down to the cases that are inoperable. The unfortunate women who are beyond surgical help may be treated with irradiation and the results in some of these cases are certainly amazing. The inoperable group may give from 10 to 15 per cent five-year good end-results. Surgery could not have benefited such patients at all.

We should educate every physician and every surgeon and every medical student who is not familiar with cancer to diagnose this condition early and then to determine what method of treatment must be used. When we have done that the control of cancer will be attained.

DR. S. E. TRACY, PHILADELPHIA, PA.—Dr. Jones stated that cases of carcinoma of the uterus do not come any earlier than they did twenty years ago. That statement corresponds with our observations. At the American Oncologic Hospital this year there have been about thirty cases of carcinoma of the uterus and only one was early.

We have a few cases of cancer of the cervix treated by radical operation which are alive more than ten years; however, when we consider the morbidity and the high primary mortality of the radical operation there is no doubt that the end-results from treatment by radium will be better than from surgery. We have some cases treated with radium and deep x-ray therapy, in fact, almost all our cases are given deep x-ray therapy after the radium, who are alive and perfectly well over five years.

DR. JONES (closing).—Out of the entire group of cases we refused only 11 cases, so that we treated 97 per cent of our series, and this is twice as much as anybody can possibly do, I think, by operation. The average operability is about 50 per cent. We were justified in not recommending treatment in these 11 cases for the patients only lived six weeks after leaving the clinic. To try to treat those patients brings disrepute upon a perfectly good therapeutic agent.

Tumor of the Fundus of the Uterus, by DR. J. W. KENNEDY, Philadelphia, Pa. (Will appear in the current volume of Transactions.)

Spontaneous Rupture of the Esophagus Following Vomiting, by DR. LEWIS F. SMEAD, Toledo, Ohio. (Will appear in the current volume of Transactions.)

The Cervical Cesarean Section. A Report on the End-Results of 418 Consecutive Operations, by DR. L. E. PHANEUF, Boston, Mass. (See page 498.)

ABSTRACT OF DISCUSSION

DR. W. W. BABCOCK, PHILADELPHIA, PA.—The thing that stands out in the paper is that by doing this low type of operation the danger of rupture of the uterus during a succeeding pregnancy is largely eliminated. This is most important as one is shocked at the number of ruptured uteri secondary to cesarean section that have been reported. Apparently this is an operation, however, that requires a skilled operator. Evidently great harm might be done if the operator were clumsy. I take it that the low operation renders it rather more difficult to extract the child, which in forcible and unskilled hands might suffer injury. Apparently this type of operation takes a little more time.

The anesthetic Dr. Phaneuf has employed interested me. As to local anesthesia, which he has used successfully, much more may be given than is generally appreciated. My maximum in using local anesthesia is a pint of a 1 per cent or a quart of a ½ per cent solution. Deaths from procaine almost invariably occur from small doses of a relatively strong solution. Large quantities of dilute solution have rarely caused death. In operating within the abdomen, one can flood the retroperitoneal spaces and the tissues in the pelvis very freely without detriment to the patient. Indeed, patients in shock or early collapse often improve under free infiltration of weak procaine, adrenalin solution.

THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF NOVEMBER 11, 1930

DR. ORVILLE H. SCHELL (by invitation) reported a **Case of Persistent Uterine Contraction Ring.** (To be published in a later issue of the JOURNAL.)

DR. F. W. SOVAK read a paper on **Hemangio-Endothelioma Intravasculare of the Ovary.** (For original article see page 544.)

DISCUSSION

DR. W. S. STONE.—The scientific interest in this case is largely in the interpretation of its histologic structure. The term, endothelioma, as applied to an ovarian tumor usually indicates a complex histology. In a study which I made some years ago of the so-called Krukenberg tumor, I found that many of them, especially in the German literature, were called endothelioma, most of which were undoubtedly secondary to tumors of the gastrointestinal tract. Clinically, they cannot be distinguished and their malignant qualities may vary.

DR. F. W. SOVAK.—What Dr. Stone says is true. A great many of these tumors have been of the Krukenberg type; that is, malignant tumors have been classified as endothelioma. In the review of the literature I omitted to state that that is brought out very nicely. Also a lot of the endotheliomas are of the perivascular type, or those arising from the lymph vessels. This is a special type of tumor which forms walls or linings of luminae which are filled with red blood cells.

DR. CHARLES E. CAVERLY (by invitation) read a paper entitled **Ovarian Cysts Complicating Pregnancy.** (For original article see page 566.)

DISCUSSION

DR. CHARLES A. GORDON.—It is certainly hard to standardize and of course not even advisable to try to standardize treatment in any way because so much depends upon the size of the cyst, its location, its character, if that can be determined, and the status of the woman, as to whether she is a primipara, an old primipara, very anxious for a baby, or a multipara with a history of repeated easy labors.

If I were to crystallize my thoughts in the matter I would say that no operation should be done before the third month, and not even then unless necessary for some reason or other; that the patient should be carried to as near term as possible; and that delivery should be effected by cesarean section with removal of the cyst after the closing of the wound in the uterus. If labor is spontaneous, either by accident or design, operation should be done in the puerperium for any untoward symptom which the patient presents. Operation should be done before she leaves the hospital anyway, if possible, and the patient should be warned of the seriousness of the condition in the event of another pregnancy.

Dermoid is not at all uncommon and the tragic consequences of dermoid rupture should be borne in mind.

DR. ONSLOW A. GORDON, JR.—While we may draw different conclusions from the same set of figures, it would seem to me from the figures presented by Dr. Caverly that it is more logical to conclude, not as Dr. Charles Gordon did, that the time to operate upon these cysts is some time after the third month, but as soon as discovered to remove them, and then permit the woman to have a normal labor. That seems to me to be far more preferable because then you have a woman who is not liable to the complications subsequently and to cesarean section in subsequent pregnancies.

DR. B. P. WATSON.—One of the interesting things which has been brought out in this paper is the comparative harmlessness of the dermoid today as contrasted with what it was, say, fifteen or twenty years ago. We were taught that the dermoid was the tumor which was most likely to cause complications during pregnancy and especially during labor. The reason was that it was a tumor of the pelvis and obstructed labor. Nowadays we discover these tumors earlier in pregnancy and remove them, hence, we do not get the number of obstructed labors from pelvic tumors that we formerly got. That is very well brought out in Dr. Caverly's statistics as compared with those of McKerron, which were compiled in 1903. I feel that if the tumor is not discovered until late in pregnancy it is much better, providing it is not obstructing the pelvis, to allow normal labor to go on and then do an ovariotomy in the puerperium rather than do ovariotomy plus cesarean section which might prejudice the patient's future pregnancies and future labors.

DR. CHARLES E. CAVERLY.—Dr. Gordon mentioned a particular case of a very large cyst which was diagnosed, I believe, only after labor. Several such cases were seen among the 83 cases which I collected where the abdominal distention, unexplained and undiagnosed during pregnancy, was determined to be due to an ovarian cyst only after labor, when the small, hard uterus could be felt definitely separate from the soft, flaccid tumor mass above.

I agree with Dr. Gordon that ovariotomy should be postponed if possible until after completion of the third month of pregnancy because that is the period of greatest danger of abortion from whatever cause. I do not think that it is in line with my findings to defer operation until full term because to do so is to ignore

the risk of symptoms caused by the tumor and that of complications which may occur in the tumor. As Dr. Gordon says, if a cyst is first diagnosed near the end of pregnancy, if the patient can be kept under observation, and if labor and delivery promise to be not unduly complicated, then it is better to await full term and possible spontaneous delivery, rather than to do a cesarean section, because thereby can be avoided an incision in the uterus which might necessitate subsequent section with other pregnancies.

Dr. Watson says that labor obstructed by a dermoid cyst in the pelvis is seldom seen now, although formerly not uncommon. That is due, I think, to the more thorough antepartum examination and treatment, certainly in an obstetric hospital practice, of the present day as compared with former times.

DR. JAMES A. CORSCADEN read a paper entitled **The Late Anatomic Effect of the Radiotherapeutic Menopause.** (To be published in a later issue of the JOURNAL.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF DECEMBER 9, 1930

DR. C. E. GALLOWAY, Evanston, Ill., presented (invitation) a paper entitled **Postpartum Care.** (For original article see page 558.)

ABSTRACT OF DISCUSSION

DR. WILBUR WARD.—What struck me as the most practical point was the care in the intermediate stage. I do not believe a woman can go through pregnancy and labor, get into a chair on the sixth day, be on her feet on the seventh day, go home on the twelfth day and resume her normal activities at once, take care of the baby, herself, her family, and household. Dr. Galloway's method in his own locality of having some one representing him go out to the homes of patients when they are not able or qualified to look after themselves and tell them how to do things to relieve the burden is subject to modifications in the various localities, but it is a mighty good idea.

DR. O. PAUL HUMPSTONE.—I wonder if the exercise that the doctor advises after labor is not begun too soon. The careful observation of whether there is any subinvolution which might cause an embolus is not always carried out in a hospital, and the woman is routinely told to take the knee-chest exercise beginning the twelfth day. I might report that we have had two cases of embolus following this and now we do not begin any postpartum exercise until the fourth week when the patient begins with her knee-chest exercises and two weeks later begins her abdominal exercise.

DR. E. C. LYON, JR.—Our custom has been to watch the patient carefully during pregnancy for anemia and with certain low percentages of hemoglobin and red blood cells to always have the donor ready outside the delivery room, and in that way we feel we accomplish a good deal in avoiding postpartum bleeding which might otherwise become serious.

SYMPOSIUM ON RESUSCITATION OF THE NEWBORN

DR. DOUGLAS MURPHY (by invitation) described the **Drinker Respirator Treatment of the Immediate Asphyxia of the Newborn.** (For original article see page 528.)

Dr. Pol N. Coryllos read a paper (by invitation) entitled **Atelectasis, Asphyxia and Resuscitation in the Newborn.** (For original article see page 512.)

Dr. P. J. Flagg submitted a paper (by invitation) on **The Treatment of Postnatal Asphyxia.** (For original article see page 537.)

Dr. Yandell Henderson presented a paper (by invitation) on **The Inhalational Method of Resuscitation from Asphyxia of the Newborn.** (For original article see page 542.)

Dr. B. Crothers presented **The Mechanism of Labor From the Viewpoint of the Neurologist.** (For original article see page 526.)

Dr. George W. Kosmak presented the **Viewpoint of the Obstetrician in Asphyxia Neonatorum,** as follows:

The obstetric point of view with regard to asphyxia neonatorum may be somewhat different from that of the physiologist, the neurologist, the pathologist, and other groups of workers who have interested themselves in the problem. Asphyxia of the newborn is a complication of pregnancy and labor that the obstetrician must always fear and be prepared to meet the emergency. Methods of resuscitation have been largely modified in recent years and many varieties of mechanical apparatus have been introduced which show, I assume, the imperfections of such procedures. Moreover, they are usually costly, delicate in their mechanism, and should only be operated by a person well qualified to do so.

It seems to me that the obstetrician should be prepared to anticipate the need for resuscitation measures by timely recognition of the factors which produce the condition. From this particular point of view I believe it is possible to divide cases of asphyxia neonatorum into several groups as follows:

1. Where asphyxia has occurred before delivery, due to interference with the circulation through the cord by knots, pressure or prolapse, placental separation, ruptured velamentous cord, low placental insertion, tetany of the uterus, and narcosis, analgesia or anesthesia of the mother.

2. Where asphyxia occurs during labor, as from prolonged pressure on the head in the birth canal, during the process of version, instrumental delivery, premature inspiratory efforts.

3. Where asphyxia occurs after labor or from injury to the cerebral vessels due to sudden compression or release of the head as it passes through the pelvic canal, from injuries to the cord or head in the process of version and from forcible efforts at resuscitation aggravating the condition by the production of injuries.

4. Prematurity, in which as the result of defective development the respiratory mechanism is unable to function.

5. Asphyxia from analgesia of the mother.

Clinically the recognition of asphyxia before labor can only be determined by the alteration in the fetal heart sounds, or in vertex presentations by the passage of meconium. The so-called intrauterine cry has also been assumed to be an indication of trouble but this is a rather doubtful sign.

Asphyxia coming on at varying periods after delivery has been attributed to atelectasis and this in turn has been accepted for a basis for pneumonia. Experimental evidence seems to confirm the latter; at the same time, fairly conclusive

evidence has been brought forward by the Sloane group that a large number of neonatal pneumonia cases are due to the inspiration of liquor amnii and other materials. I also believe that other foreign bodies may be inspired such as the fuzz from blankets, and there is no doubt that in crowded nurseries pneumonia of an infectious type may occur. However, this is somewhat outside the province of this symposium.

The treatment of asphyxia by the obstetrician must depend on the facilities at hand. The various devices which have been developed for the treatment of asphyxia in the newborn are of undoubted value but the attendant is usually forced to rely on simpler methods. Removal of mucus from the mouth or the trachea, keeping the baby quiet and warm, careful compression and relaxation of the chest, together with massage of the heart in some cases, mouth to mouth insufflation, and the use of hot and cold tubs offer the safest means for making the baby breathe. Personally I have discarded slapping, the various swinging maneuvers, or holding a deeply asphyxiated baby with the head downward as provocative of injuries that may contribute to make a previous asphyxia a permanent one and result in the loss of the baby. Where obtainable, the careful administration of carbon dioxide mixtures as advocated by Dr. Henderson, is strikingly important from the results obtained and this procedure is worthy of increased attention.

ABSTRACT OF DISCUSSION

DR. RICHARD N. PIERSON.—Dr. Crothers commented on the surprising fact that in all the evening's discussion on asphyxia in the newborn, no mention was made of the physiology of labor and its effect upon the child. If we are to prevent asphyxia in the newborn, we, as obstetricians, must concentrate on the physiology of labor and realize that every deviation from the normal will have its effect upon the child. It is well to remember the influence of all sedative, analgesic, and anesthetic drugs in causing asphyxia in the baby. I believe that anyone who has used carbon dioxide and oxygen for the resuscitation of the newborn will agree with Dr. Henderson that it is wonderfully affective and should always be available. The simple methods of administration seem to me effective. I am not convinced that the elaborate apparatus of Drinker or that of Flagg is needed.

DR. J. M. MABBOTT.—It occurs to me to inquire whether other mixtures have been employed rather than oxygen and carbon dioxide only. Further, in view of the fact that the baby is expected to breathe air which is only 20 per cent oxygen, if I remember, and 80 per cent of other things, mostly nitrogen, the suggestion might be advanced that possibly some other mixture could be used requiring less carbon dioxide to stimulate the medulla and cause deep respiration. I would like to know whether mixtures including nitrogen and oxygen have been used.

DR. P. N. CORYLLOS.—I was greatly impressed by the statistics presented by Dr. Henderson, and the great number of newborn lost every year, either from acute asphyxia or from subsequent respiratory complications due to persistence of bronchial obstruction and of partial atelectasis. We all agree that extrauterine life is not possible without adequate respiratory gas exchanges in the lungs which insure adequate oxygenation of the blood, elimination of CO_2 and regulation of the acid-base equilibrium, indispensable for the normal function of the respiratory center.

Therefore the first and most important indication in asphyxia of a newborn is to eliminate any mechanical obstruction not only of the larynx but of the trachea and the bronchial tree itself. The method advised by Dr. Flagg seems to me the most adequate for that purpose. There is no doubt in my mind that patency of the tracheobronchial tree is the most important factor in resuscitation in gen-

eral and more particularly in the newborn, in which conditions are less favorable because of the presence of atelectasis and the absence of negative intrapleural pressure. It seems very peculiar that so little attention has been given so far to this important factor; we try by indirect methods to clear the bronchi when it is so simple to do it by direct laryngoscopy, so easy a procedure in the asphyxiated newborn that not only every anesthetist but also every obstetrician and medical man should be able to use it. Furthermore, insufflations of CO_2 and O_2 by the same way accomplish far more than any other method by actively dilating the atelectatic lung and consequently increasing the circulation in this organ and in this way bringing the respiratory gases into the blood.

Dr. Henderson has insisted with reason upon the danger of subsequent infectious complications in persistent obstructive atelectasis. I am most gratified that he admitted the relation of the latter to pneumonia and bronchopneumonia of the newborn, and that he pointed out the similarities of these complications, to postoperative atelectasis, pneumonia, and bronchopneumonia. What I cannot understand, however, is that he hesitates to introduce medical lobar pneumonia into the same group, although he has admitted not only the pathologic and bacteriologic identity of it with postatlectatic pneumonia as well in the newborn and in postoperative pneumonia, but, also strongly advises the same treatment in all three of them, namely O_2–CO_2 inhalation.

As for the Drinker apparatus, so ably presented by Dr. Murphy, I have a few objections. I think that this method, which is familiar to me, because I used extensively a very similar apparatus described as "oscillating vacuum box" in my experimental work with Dr. Birnbaum since 1925, simply replaces the manual artificial respiration by a mechanical and more physiologic method of artificial and rhythmic expansion of the thoracic cavity. It neglects, however, the other two very important factors in the establishment of the normal and automatic function of the respiratory center; first the patency of the bronchi, without which no pulmonary expansion is possible, however strongly we expand the thoracic cage, and second the regulation of CO_2 in the circulating blood, without which no regular function of the respiratory center is possible.

I would say a word on traumatic lesions of the respiratory center, so thoroughly presented by Dr. Bronson Crothers. There is no doubt that increased intracranial pressure has a great influence upon the function of this center, notwithstanding its highly developed automatism which allows its separation from the cerebrum and the spinal cord, by sectioning the medulla above and below the striae acusticae without greatly affecting its function. But on the other hand the question could be raised if it is really desirous to save infants with serious intracranial traumatisms, considering all subsequent complications to which they are exposed because of this hemorrhage.

DR. YANDELL HENDERSON.—I was glad to hear Dr. Crothers say that in his judgment as a rule those children who ought not to live because of a neurologic defect do not breathe. Von Reuss states that there is no evidence that a very prolonged labor causes subsequent neurologic defects. That is the German evidence.

Failure to breathe, or poor respiration is often due to intracranial hemorrhage. At the Massachusetts General Hospital, some years ago, Dr. J. C. White, on my advice, administered inhalations of carbon dioxide and air after surgical operations. In three or four cases after brain operations on adults, there was a slow postoperative hemorrhage. Respiration went down from 8 to 6 to 4 to 2 per minute. In all these cases administration of enough carbon dioxide to overcome the de-

pression of the respiratory center maintained respiration; and the patients lived. There is good reason therefore why the same treatment should be used and the same result expected in intracranial hemorrhage in the newborn.

I wish to assure Dr. Murphy that there is no fundamental disagreement between us. He is working particularly on extreme cases on the borderline of complete stillbirth. I, on the other hand, am trying to direct attention to those babies who are born normal and afterward develop a depression of respiration leading to pneumonia. If a hospital can afford a Drinker apparatus and can save 1 in 1,000 or 1 in 5,000 children, it is a life saved. My efforts are directed rather to a prophylaxis for the very much larger number of children who now develop pneumonia in the first few weeks of life. Such pneumonia is the result of continuing areas of atelectasis. Neonatal pneumonia will be largely eliminated when every child, strong and normal as well as weak or premature, receives an inhalation of carbon dioxide in oxygen. That practice is surely coming. Dilate the lungs in this way and neonatal pneumonia will almost cease to occur. It now kills 4 in each 100 live births.

A question was asked about gas mixtures. Many mixtures are used. In the treatment of lobar pneumonia it is advisable to give only 50 or 60 per cent oxygen, for higher concentrations given for a long period of time have an irritant effect on the lungs. Formerly for treating asphyxia we used 5 per cent carbon dioxide, for the reason that this is the normal amount in the lungs, while 7 per cent carbon dioxide gives a normal man a slight headache. Now that the treatment is established, we use 7 per cent, which is a very much stronger stimulant. The ordinary nurse can give it by holding a mask on the child's face.

Dr. Coryllos asserts that all lobar pneumonia begins with bronchial obstruction and produces atelectasis. I hope that is true. But I do not assert it until I know.

DR. DOUGLAS P. MURPHY.—One point has impressed me as I have watched deeply asphyxiated infants, namely, that no artificial stimulus appears to inaugurate respiratory movements. If this is true, the object of treatment should be the maintenance of an adequate supply of oxygen until the respiratory center begins to function automatically and adequately. During this period the infant should be subjected to the least possible amount of trauma or metabolic activity. It is believed that the Drinker respirator fulfills these requirements better than any other method. It would seem to be the most scientific method of maintaining artificial ventilation, in that *it allows no force to be applied to the organism which cannot be both controlled and measured.*

DR. BRONSON CROTHERS.—The neurologist believes that a study of handicapped babies and a review of pathologic investigations of babies dying during, or shortly after, birth gives him a right to discuss resuscitation, which he never sees at first hand. From his point of view apnea is explained, in many cases, by lack of excitability of the medulla. If the medulla is not excitable it seems logical to maintain life without it for a while. The Drinker respirator is perfectly adapted to this purpose. If gross injury of vessels exists it seems unreasonable to force blood from the trunk into the head, yet this transfer of blood must occur when vigorous pressure on the trunk is imposed before respiration starts.

As far as I can see neurologic theorizing simply confirms the present practice of gentle and skillful obstetricians.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF OCTOBER 3, 1930

DR. WILLIAM F. NELMS read a paper entitled **A Review of the Treatment of Cases of Placenta Previa at the Brooklyn Hospital for the Past Ten Years.** (For original article see page 550.)

ABSTRACT OF DISCUSSION

DR. JOHN O. POLAK.—We cannot pass over the remarkable records of the treatment of placenta previa by Bill of Cleveland without concluding that cesarean section has a certain definite place. Our own feeling has always been that there are definite factors which determine what we shall do, namely; the condition of the cervix, the parity of the woman, the amount of blood loss, the period of gestation, the condition of the child and of the patient, together with the presence or absence of sepsis. If we could teach the practitioner that by the use of a hypodermic of morphine the uterine contractions will cease and the hemorrhage stop in the majority of instances, and if he would avoid packing, many of the cases that are brought to the hospital would be saved from infection.

I believe that we can do more by the simple rupture of the membranes in the partial and marginal cases, leaving them alone and applying an abdominal binder, than by the use of bags and version. We had considerable experience with bipolar version both at the Jewish and Long Island College Hospitals. In a series of 63 consecutive cases the maternal mortality was only 2 per cent and fetal mortality 53 per cent. A simple bipolar version was done, bringing down a foot and allowing the woman to expel the baby, thus avoiding trauma and rupture into the lower uterine segment.

DR. JOSHUA RONSHEIM.—At the Jewish Hospital of Brooklyn from 1908 to 1929, inclusive, there were 205 cases of placenta previa with a maternal mortality of 12, or 6.3 per cent, for the entire twenty years. We have a great many men at the Jewish Hospital doing obstetrics, and I think of those 205 cases about 40 have come under my personal supervision. In that group I have done two cesarean sections; one of the patients was a primipara with a central placenta previa at full term with a long undilated cervix, and in which vaginal manipulation was out of the question. The second one was done only a couple of years ago in a girl who had a flat pelvis. She had had a previous version and breech extraction done because of unengagement of the head, with a stillbirth and a third degree laceration. In her second pregnancy she came under my care and when she was thirty-five weeks pregnant she suddenly had quite a severe hemorrhage. Examination showed a placenta previa of, I should say, the marginal type. Inasmuch as she had this calamity with her first baby, while I did not think the contraction of her pelvis was sufficient to cause any difficulty with delivery of the aftercoming head, I did think that the placenta previa in combination with the dystocia due to contracted pelvis was sufficient to justify section. We had no maternal mortality in those two; as a matter of fact, up to this time I have never lost a mother from placenta previa.

I believe that 15 to 20 per cent of the patients with placenta previa will deliver spontaneously, after rupture of the membranes. Following that, ignoring for a moment the baby, with two fingers' dilatation, the best procedure without doubt is a Braxton-Hicks version, but the trouble with that is that very few men know how to do it, and by the time they have accomplished it, instead of having

two fingers' dilatation, they have almost complete dilatation from laceration of the cervix. Second, there are a great many men who cannot resist the temptation after they have done a Braxton-Hicks to do an immediate delivery rather than to put the patient back in bed and leave her alone; they want to save the baby and in that way they lacerate the cervix and have postpartum hemorrhage and death.

DR. HARRY W. MAYES.—The treatment of postpartum hemorrhage is practically the same at the Methodist Episcopal Hospital as that which has been outlined by Dr. Nelms for the Brooklyn Hospital. One of the most important factors is an adequate preparation to meet the hemorrhage should it occur. In every case in which bleeding is obvious or suspected, we have the patient grouped and the blood matched for transfusion. The lives of a great number of patients are lost from hemorrhage because of the time lost before giving the transfusion.

A patient, Mrs. C., was admitted to my service at the Hospital on August 10, 1930, para ii, twenty-eight years old. Her first confinement was a spontaneous, L.O.A., in 1925. Three weeks before admission to the hospital, she had a slight bloody discharge and a rather profuse hemorrhage at home on the day of admission. She was found to be Type IV and to our surprise, her blood was found compatible with each of her three sisters. On the morning of August 11 a vaginal examination revealed the presence of a marginal placenta previa and this was followed by a rather severe hemorrhage. The patient was prepared and had been instilled according to the mercurochrome technic. The membranes were ruptured and a No. 3 bag inserted. This controlled the hemorrhage temporarily and a direct transfusion of 500 c.c. of blood was given. Following the transfusion the bag was found to be through the cervix and was removed. The bleeding continued; a version was done; the cervix soon dilated, and the delivery was easily completed. There was a morbidity for the first five days and I was rather fearful lest she might be developing a postpartum infection, her temperature reaching 103.8 on the third day. A second transfusion was given on the fifth day, the temperature dropped immediately to normal where it remained. On August 12 the blood count showed 2,500,000 red blood cells, with 44 per cent hemoglobin, 14,000 leucocytes, and 88 per cent polynuclears. On August 15, while she was still running the temperature, her red blood cells were 3,200,000 hemoglobin 44 per cent, leucocytes 7,200, polynuclears 68 per cent.

DR. J. O. POLAK.—Both of the previous speakers have spoken about having donors ready. We not only have the donor ready but give the transfusion before we start our work. If you are going to do a cesarean section in placenta previa or in ablatio, I would very strongly advise having the patient transfused if she has lost any considerable amount of blood, before the section is done. It is surprising to see how quickly the uterus will contract and how perfectly she will recover. These patients always have a little secondary anemia, they sensitize themselves to it, but they will not stand the extra shock and trauma of anesthesia without more blood, and the time to give it is before you need it. Another point is, if we are going to do a cesarean section, do it under local anesthesia and we will not have as much immediate or postoperative trouble as with a general anesthetic.

DR. CHARLES A. GORDON.—I do not believe that the treatment of these cases should depend upon whether the case is one of marginal, lateral, or central placenta previa; those are purely academic considerations.

The decision as to the type of operative procedure, if any, that should be employed depends, as has been pointed out, upon the condition and the parity of the patient and the condition of the cervix.

We have handled our cases of placenta previa in a way that is very similar to that pointed out by Dr. Ronsheim, not using cesarean section at all, until lately, when I have been impressed by the fact that the obstetrician should consider the baby. To my mind, sacrifice of the baby does not seem like good obstetrics. The duty of the obstetrician is two-fold—first, to get the patient through with as little morbidity as possible, and, second, to save the baby if possible.

In the final analysis, I believe that the treatment of these cases depends upon what a man feels he can do in placenta previa as in all other types of work. If he feels he is proficient in doing a Braxton-Hicks version and has had considerable experience with it and feels he will not rupture the uterus, as so often happens, and his results are good from that procedure, then I think that is the thing to do. Certainly the statistics presented by Dr. Ronsheim are very impressive. We often see very much worse cases than you have reported here, in Greenpoint Hospital and in St. Catherine's Hospital. Transfusion will never save them; as has happened in some instances rupture of the uterus occurs as part of the operative procedure.

DR. VICTOR L. ZIMMERMANN.—More and more obstetricians are turning to abdominal delivery in cases of placenta previa. I believe it is indicated in primiparae and in multiparae with rigid and undilated cervix. But too much dependence must not be placed upon cesarean section to save the baby; too often we are dealing with premature infants. So, where the cervix is sufficiently dilated or dilatable, and the baby not over large, I think the Braxton-Hicks version is to be preferred. Unfortunately, our troubles are not over with the delivery by whatever method, for we still have the dangers of secondary hemorrhage and sepsis. The low placental site makes a fertile culture ground for bacteria.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

v. Peham and Amreich's important work on *Gynecological Operations*[1] appears posthumously after the sudden death of the senior author last August. It may be regarded as an exposition of the operative methods current at the first Gynecological University clinic of Vienna, covering as it does, especially the years 1925 to 1930 during which v. Peham was professor.

In this book anatomy is especially featured, with marvelous and profuse illustrations, the majority in colors, 448 in all. Both the text and the illustrations feature particularly the vaginal operation for carcinoma, the abdominal operation for the same disease in which the pelvic anatomy is exceptionally well described.

In the first portion of the volume, which deals with general topics, local anesthesia is described and illustrated most minutely, including the anesthesia of Schuchardt's incision, anesthesia of the spermatic and hypogastric nerves, as well as sacral anesthesia. These descriptions are recommended for thorough study by all gynecologists. In five years of 2290 major operations performed, lung complications developed in 142—114 bronchitis, 24 pneumonias, 4 pleurisies. There were 6 deaths among the pneumonias. Thrombosis and embolism occurred 72 times in the same number of operations. Of these, 66 were definitely diagnosed, a percentage of 2.9. As usual, the highest incidence was noticed among the fibroids, 4.2 per cent, the lowest among operations for ovarian tumors, 1.9 per cent. There were 9 fatalities. Five embolisms of the pulmonary artery occurred. A good anatomic description of the various abdominal incisions is given.

The chapters on anatomy concern themselves to a great extent with the pelvic connective tissues. The endopelvic fascia and its relation to the various intrapelvic structures is clearly demonstrated by beautiful charts.

The chapter dealing with the special gynecologic operations shows that absolute cures in 29.2 per cent were obtained in carcinoma of the cervix but the statistical tables are too incomplete to permit of thorough analysis. Raying is limited to inoperable carcinoma. However, postoperatively, many of the cases are rayed. As a preliminary to operation on cervical carcinoma, thorough excochleation and cauterization immediately before the operation is performed.

v. Peham being a pupil of Schauta, the vaginal operation of carcinoma is preferred. In every instance a deep Schuchardt incision to the point where the vagina is circumscribed to form a cuff is performed. The authors emphasize the importance of demonstrating the proper vaginal layers in which separation should be attempted. The minutest technical details are described both by text and illustration, and emphasis is placed upon possible sources of error.

In the abdominal operation for carcinoma, Latzko's technic is apparently performed. The ureter is exposed throughout its course and then the paravesicle and pararectal spaces are opened, and clamps extending to both of these areas are placed far out on the parametria. Not before this portion of the operation has been completed is the area posterior to the uterus attacked mesial to the fully mobilized ureter. The levators ani consequently are exposed, denuded of their

[1] **Gynaekologische Operationslehre.** By Dr. H. v. Peham u. Dr. J. Amreich. Berlin, 1930, S. Karger.

fascia. A good description of Wertheim's technic is likewise given. In 258 cases during five years, the operative mortality was 6.6 per cent. In 1253 cases of supravaginal hysterectomy, stump cancers later developed in 0.6 per cent.

A less detailed, although a clear description is given in the operation of simple vaginal hysterectomy, especially for metropathia. Of these cases only 50 per cent were treated by radiation. The operative technic for hysterectomy and fibroid uteri are fully described in the text and well illustrated. In fact, in this section, a number of illustrations could be deleted without affecting the clearness of the description.

Although the difficulty in the diagnosis in ectopic pregnancy is stressed, no mention of the Aschheim and Zondek test for pregnancy is given. In 156 operations for ectopic gestation, only 1 death occurred.

I am glad to note that, although v. Peham is a strong advocate of the vaginal method of approach he strongly advocates the abdominal route in inflammatory conditions. A conservative attitude in the treatment of inflammations is shown. Of 2691 cases 44.7 per cent were hospitalized, the rest being treated ambulantly. Only 227 operations were performed for inflammatory diseases, that is 10 per cent of the entire number, of which 8 died, a mortality of 2.9 per cent.

The description of operations for tuberculosis of the genital tract and of ovarian tumors is much shorter but as the anatomy and technic has been so fully described in connection with other operations, this saving of space is to be commended.

The operations recommended for prolapse are particularly the interposition operation, ventrofixation, the Baldy, and Doléris in connection with anterior and posterior colporrhaphy. Even the operation for complete tear is detailed and illustrated. Apparently the Vienna school still favors exposure and suture of the levatores in posterior colporrhaphy. The operation for cystocele recommended still employs the tobacco pouch purse string on the bladder which, in the United States, has been generally abandoned. The author speaks of fascia overlapping in anterior colporrhaphy without mentioning either Bissell or Rawls.

For the construction of an artificial vagina, Schubert's technic is described with the employment of the lower portion of the rectum. Two of these operations were performed during the last five years, with perfect results.

A short description of vesicovaginal and rectovaginal fistulas is given. Incontinence of urine was operated upon 14 times, all successful, using what corresponds to the Kelly urethral technic, fortified by fascial duplication. This is an exceptionally good record of success. The anatomy and operative treatment of Bartholinian cyst is given in detail, the concluding description dealing with removal of the appendix.

This is an individual book, most carefully worked out, informative and well written. In conclusion I feel justified in once more drawing attention to the wonderful anatomic illustrations. This book will remain a permanent memorial to v. Peham.

—*Robert T. Frank.*

De Mora has written a monograph on *Solid Tumors of the Ovary.*[2]

His classification of connective tissue tumors is conventional. His description of primary epithelial tumors differs greatly from that usually found in the literature, greater emphasis being placed on the supposed origin than appears warranted by our present state of knowledge. Based on the original observations of Winiwarter which has been amply confirmed by modern physiologists and anatomists, he accepts postnatal ovogenesis and classifies a number of malignant

[2]**Les Tumeurs Solides de L'Ovaire.** By J. Luis E. de Mora. **Preface de M. Le Prof. A. Gosset. Paris, 1931, Gaston Doin & Cie.**

tumors as originating from these sources. Among them are "seminomas" of the ovary which he compares directly with the tumors of similar name in the testis. As no microscopic illustration of these growths is given, it is difficult to classify them according to the more accepted nomenclature.

He next discusses chorionepitheliomas and folliculomas of the ovary, likewise without illustration. "Pflugörian" epitheliomas and epitheliomas of the corpus luteum are next described and a classification based on superficial papillary growth is likewise given. The concluding paragraphs on primary cancers of the ovary include carcinomata arising from wolffian rests. This chapter on primary carcinoma of the ovary will prove of little value to the clinician or practical pathologist but is worthy of study by those interested in the theoretical etiology of cancer. Although solid teratomas are discussed, this section is likewise not illustrated.

The second half of the book deals with the treatment and diagnosis of ovarian growths.

The third portion contains the history and description of 24 unpublished cases. The follow-up is too incomplete to be of value.

A considerable bibliography concludes this monograph.

—*Robert T. Frank.*

Cuthbert H. J. Lockyer has retired from active practice. He has left his unique collection of obstetric and gynecologic specimens to the Charing Cross Hospital Medical School and made it available and useful by preparing a minute catalogue of the specimens.[3] This collection embraces the material gathered over a period of thirty-five years by a gynecologist who at the same time was one of the best known gynecologic pathologists. More than 1100 gross specimens are available for inspection, fortified by 1800 microscopic sections which refer directly to the specimens preserved for macroscopic study.

The obstetric specimens cover fetuses from the eighteenth day of development on. A number of rare monsters are described. Such rare conditions as tumors of the placenta and of the umbilical cord are included; likewise 4 cases of ovarian pregnancy and a pregnancy in an accessory horn.

Among the gynecologic specimens, 4 sarcomas of the vagina are shown. Both common and rare conditions of all the pelvic organs will be found on the shelves of this collection. Among the unique specimens is a teratoma of the fallopian tube.

The Charing Cross Hospital Medical School is to be congratulated on having at its disposal this wonderful teaching collection which we trust will be kept up and added to by future obstetricians and gynecologists.

The catalogue is made more valuable by numerous references to the literature which accompany the descriptions of both gross and microscopic specimens.

—*Robert T. Frank.*

Dr. Crossen's very extensive revision of his *Operative Gynecology*[4] marks a significant trend in the practice of this specialty. In his inclusion of surgery of the urinary and the intestinal tracts he indicates the widening field which the surgical specialist for the pelvic organs of women and their closely related systems occupies and covers this ground with word and picture in a most thorough manner. This edition, as heretofore, is built around three premises: is operation needed, what operation should be selected, and what to do for the patient before and after the operation.

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[3]**Catalogue of the Lockyer Collection of Obstetric and Gynaecological Specimens.** By Cuthbert H. J. Lockyer. London, 1930, John Bale, Sons & Danielsson, Ltd.

[4]**Operative Gynecology.** By Harry S. Crossen and Robert J. Crossen. Ed. 4. St. Louis, 1930, The C. V. Mosby Company.

Consideration of the uterosacral ligaments has been transferred from retrodisplacements to the section on uterine prolapse. The recapitulation of operations for prolapse, the suggestions for the type of operation to be selected, and the general plan adopted by the author in treating such cases, brings out all the recent advances in plastic surgery of the pelvis.

The former discussion of fistulas has been evolved into a new and fully descriptive chapter on Genital Fistula. Among other new material we find here Coffey's technic for ureteral transplantation.

Operability and operation risks in myoma of the uterus are clarified. The author refers to the differences in his technic of hysteromyomectomy from those elaborated in some recent popular discussions of the subject, among others Richardson's. In the chapter on carcinoma there is a full discussion of the classification and operability of cancer, the physics of radium and roentgen ray and the indications and methods of their use. A description of the former extensive radical operation has been retained as a guide for the less severe operations which may be indicated in operable cases. Certain palliative procedures as the Percy cauterization and Byrne knife are included. The author stresses the dangers of peritonitis and intestinal paralysis in surgery of endometrial ovarian cysts, and brings out the necessity for drainage in such cases. The surgical treatment of anomalies and malformations of the genital organs is dwelt on at length, considerable discussion being devoted to the subject of formation of artificial vagina, Pemberton's review and Baldwin being quoted extensively.

Lesions of the lower urinary tract and their surgical handling form a new chapter written by Dr. R. J. Crossen, co-author of this edition. In an excellently written chapter by Dr. H. S. Brookes, Jr., are discussed the lesions of the intestinal tract which may be met in association with, or as complications of, diseases of the pelvic organs. This discussion ranges from simple anal fissure excision to resection of the colon; various types of herniorrhaphy are also described. Dr. Brookes has also expanded the few paragraphs on anesthesia in a previous edition to a well-balanced chapter on anesthesia in which he cautions against an enthusiastic overuse of spinal anesthesia.

Over four hundred new illustrations have been added to this edition to correlate the changes in the text. The book will continue to be an invaluable aid to those engaged in surgical treatment of the diseases of women.

—Philip F. Williams.

This manual, *The Puerperium*,[5] discusses briefly the normal and abnormal convalescence of the parturient woman. An equal amount of space is devoted to the newborn, healthy and diseased, with a chapter on artificial feeding of infants.

While in some respects the book is sketchy, for instance the discussion of pyelitis and hemophilia, there are many excellent and practical suggestions for the care and comfort of the recent mother and her infant. Among the inconsistencies may be mentioned the almost simultaneous discountenancing and recommendation of chloroform in postpartum eclampsia; among the omissions, the neglect to mention blood transfusion in hemorrhage, anemia, or infection.

—Philip F. Williams.

That this *Text-Book of Histology*[6] has reached a fifth edition in fifteen years is evidence of its popularity as a textbook of the fundamental science courses. The format is excellent, the illustrations well executed, and the technical directions clear.

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[5]**The Puerperium or The Management of the Lying-In Woman and New-Born Infant.** By C. Nepean Longridge. Ed. 2, London, 1924, Adlard and Son and West Newman, Ltd.

[6]**A Text-Book of Histology.** By Harvey Ernest Jordan. Ed. 5, New York and London, 1930, D. Appleton and Company.

That recent advances in allied subjects have also been thoroughly reviewed for inclusion in this edition is shown in the chapter on the reproductive system. Here the latest attitude of the physiologists toward the relation of ovulation, menstruation, and hypophysis function is fully presented. Occasionally the phraseology is slightly obscure, as " . . . that sex differences are largely differences in degree of differentiation; in other words, the femaleness represents in essence inhibited maleness."

—*Philip F. Williams.*

The seventh installment of Hirsch's *Handbuch der Inneren Sekretion*[1] is short and contains three chapters dealing with the importance of lipoid substances in endocrinology. This subject is as yet in its infancy. The first chapter contributed by Berberich and Jaffé covers the morphology of the lipoid metabolism in reference to the endocrine glands. The results obtained by purely histochemical methods appear doubtful. Of chief interest are the changes in the suprarenal glands with their effect on the blood cholesterin.

The second chapter was written by K. Westphal and W. Mann. It covers the clinical-physiology and pathology of lipoid metabolism. Here again the subject of the effect of adrenal diseases on the cholesterin content in the blood, and the cholesterin changes noted in pregnancy are the main contents.

H. Handovsky has written the last chapter which deals with the chemistry of aliphatic lipoids. The chemistry of such bodies as the phosphatides, sphingomyelin, and galactolipines and lipoids mixtures are discussed.

The eighth installment[1] contains an important contribution on development and growth by F. Gudernatsch of New York.

Development and growth are phenomena which are regulated not only by the internal secretory processes and hence regulatable by nonspecies specific influences, but also are affected by nutrition, temperature, light, diseases, etc.

In the period of early embryonal development, the thyroid is one of the strongest agents in producing organ differentiation. The author goes into great detail on all the thyroid effects, and in particular the changes produced in tadpoles. Thyroxin still produces its effect in a dilution of 1 to 100,000,000. The effect of the thymus in mammals is in doubt. The entire history of the growth effect of the anterior hypophysis is discussed in its application to both the female and male gonads.

A short discussion is devoted to human physiologic and clinical phenomena. This chapter is very sketchy.

The phylogenetic position of the internal secretions is described in an interesting fashion. Of the glands of internal secretion, the thyroid appears the oldest, being noticed as the endostyl in forms which are transitional between vertebrates and invertebrates. The other glands are phylogenetically younger, and appear only in the vertebrate series. Other subjects dealt with are growth and differentiation as life processes. Protein is essential and both lysin and other amino acids are especially important.

The subject dealt with by Gudernatsch covers an enormous field. He gives an excellent summing up of this huge amount of material.

—*Robert T. Frank.*

Part I of volume VII of *Handbuch der Speziellen Pathologischen Anatomie und Histologie*[2] covers the uterus and tubes, forming a large tome of 931 pages. The

[1] **Handbuch der Inneren Sekretion.** Band II. Lieferung 7 und 8. Herausgegeben von Dr. Max Hirsch. Verlag von Curt Kabitzsch, Leipzig.

[2] **Handbuch der Speziellen Pathologischen Anatomie und Histologie.** Herausgegeben von F. Henke und O. Lubarsch. Siebenter Band. Erster Teil. Verlag von Julius Springer, Berlin, 1930.

largest contributions are those of Robert Meyer, dealing with the pathologic anatomy of the uterus (624 pages), hydatid mole and chorionepithelioma malignum of the uterus by the same author, covering 175 pages, and a shorter chapter on the fallopian tube by Oskar Frankl, 50 pages in length.

The discussion of malformations is somewhat involved. In sharp contradistinction the endometrial changes are most clearly described but the description of the hormonal basis producing the cyclical variations could be improved. Post climacteric bleeding is especially well described. Meyer doubts the existence of an endometritis luetica but accepts and also pictures gumma of the uterus.

Meyer ascribes the etiology of uterine myomata to unripe muscle cells which lie free in the interfascicular connective tissue, by preference in the vicinity of large vessels. The vessels themselves arise genetically from the uterine wall. The author is unwilling to concede any hormonal etiologic influence on the growth of myomata.

Adenomyosis cervicis interna he considers of inflammatory and traumatic origin, and compares such conditions to the invasion by a pseudomucin cyst epithelium into the uterine wall, with resultant muscle hyperplasia when arising from an adherent ovarian pseudomucin cyst.

The description of both cervical and corpus carcinoma is very detailed and sound. In the diagnosis from biopsy which he naturally favors, he states that in general mitotic and nuclear changes appear too late to be of use in the diagnosis of early carcinoma. He emphasizes that his own diagnostic skill has been improved by watching the course of individual cases, difficult to diagnose, over a long series of years. This is sound advice which every pathologist and clinician should take to heart.

The subject of hydatid mole and chorionepithelioma is preceded by nearly 50 pages of introductory matter dealing with the genital changes in placentation, the hormonal changes in pregnancy, etc., which are of great value. He speaks of a subvariety of hydatid mole which he calls "fibrous hydatid mole." The histology, chemical, and biologic diagnosis of both chorionepithelioma and hydatid mole are dealt with in detail.

The value of this classical contribution to gynecologic pathology from the pen of this well-known author, is greatly enhanced by the use of numerous illustrations, many of which are in colors and all of them noteworthy for their accuracy and clearness.

Oskar Frankl deals in a short and rather summary fashion with the diseases of the tubes. In 100 pyosalpinges he found microorganisms in only 32. He considers the only method of classifying salpingitis is through bacteriology, as various stages may exist coincidentally. Frankl believes that salpingitis isthmica nodosa rarely is of inflammatory origin. A definite increase in the number of ectopic gestations compared to normal pregnancy has been recognized in Europe. In 1907 only 1.8-1000, in 1920, 19.3-1000. He agrees with Litzenberg that no true decidua basalis or capsularis is found in ectopic. In contrast to the drawings illustrating Meyer's contributions, those of Frankl are poor and too schematized.

—*Robert T. Frank.*

The first part of the seventh book of the *Handbuch der Mikroskopischen Anatomie des Menschen*[3] consists of two divisions, the first, the Excretory Apparatus by Möllendorff of Freiburg, containing 329 pages, the second, the Female Sexual Organs by Robert Schröder, consisting of 225 pages.

The chapter on the excretory apparatus is divided into four subdivisions: kidney, renal pelvis, ureter, and urinary bladder. There are 259 pages devoted to an

[3]**Handbuch der Mikroskopischen Anatomie des Menschen.** Herausgegeben von W. v. Möllendorff u. R. Schröder. Siebenter Band. Julius Springer, Berlin, 1930.

exhaustive discussion of the finer anatomy of the kidney. Möllendorf's original investigations of the glomerulus have added much to our knowledge of its finer structure. The analysis of the structural units of the glomerulus is clear and illustrated by numerous excellent drawings. It is interesting to note that Möllendorf does not accept differences in the caliber of vas afferens and vas efferens. The conception that glomerular epithelial cells are morphologically and biologically equal to the pericytes of the capillaries is of importance for the interpretation of pathologic conditions. Figure 30 is very instructive. It demonstrates how complicated the histologic analysis of the glomerulus is and shows how tangential flat sections have to be considered. It illustrates the possibility of misinterpretation of structural details. The absence of anastomoses between the glomerular capillaries and the enormous surface area account for the possibility that the glomerulus is the main structure of the kidney employed in the excretion of the urinary substances. There is a detailed description of the tubular portion of the renal parenchyma with good illustrations. Regarding the vascular supply of the kidney, Möllendorf believes that practically all the blood first passes through the glomeruli before entering the capillary system of the cortex. The arteriolae rectae are mainly branches of the vasa efferentia.

A long chapter is devoted to the discussion of storage and excretion of substances through the kidney. In more than 50 pages a survey of the comparative histology of vertebrates is given.

Limitations of space have forced Schröder to confine himself strictly to the genital apparatus of the human female. His treatment of the subject is chiefly morphologic and only microscopic data are considered. The egg cell always remains undifferentiated. In the newborn, graafian follicles which reach the size of six millimeters are regularly found. He considers the uterine bleeding noted in the newborn as a pregnancy reaction. Although due to the female sex hormone secreted by the placenta of the mother, I am forced to regard this reaction in the uterus as a pregravid (premenstrual) sensitization of the uterine mucosa. The abrupt withdrawal of the hormone following birth, in my opinion corresponds exactly to a similar withdrawal (through the excretions) found premenstrually in the adult female. The new counts of the number of ova present in the ovary of the newborn bring this number to about 400,000.

According to Schröder, Westmann's experiment in which he sucked out the granulosa layer from the ruptured follicle of the rabbit a few hours after coitus, and under which conditions no corpus luteum formation took place, offers definite proof that the lutein cells are formed by the granulosa layer and not by the thecal layer. Schröder emphasizes the changes occurring in the tubal epithelium during the menstrual cycle. He describes the uterine changes in all cyclical phases including pregnancy and the puerperium. This author disbelieves in the cyclical vaginal changes reported in the human female.

His treatment of the subject is direct, simple, and compact. Good references to the literature are included. The subject is lavishly and effectively illustrated.

—*Robert T. Frank.*

The sixth edition of Williams' *Obstetrics*[4] shows an increase in size and format, making it a volume of over 1100 pages. Like good wine, this book improves with age. The present edition shows much revision throughout, and 40 additional illustrations have been added. Particular attention has been given to the advances and changes in methods of anesthesia, to the low cesarean section, to the toxemias of pregnancy, and to transfusion.

[4]**Obstetrics. A Textbook for the Use of Students and Practitioners.** By J. Whitridge Williams. Sixth enlarged and revised edition. D. Appleton & Co., New York, 1930.

The internal secretions which now play such a great rôle have been rather summarily dealt with. The "nidatory" luteal hormone is not clearly described.

The author has shown great willingness to accept new data which force him to alter his opinion on various subjects, and admits his change of view in a most frank and gratifying fashion. For example, he is now convinced of the granulosa origin of corpus luteum cells. The acceptance of at least one case of abdominal pregnancy is recorded. Bandle contraction ring, according to Williams, was definitely demonstrated in at least one case of his own.

This volume must be considered one of the most authoritative in the entire obstetric literature of all languages. It is written in scholarly and clear fashion. Only a few major points can be stressed in any review. Of these I desire to mention a number.

In occipitoposterior presentations, if the head has descended low, the author leaves the position to nature unless intervention is indicated by objective changes in mother and child. He never uses ethylene because of its high explosive property. In preference, he uses chloroform anesthesia "a la reine" and for longer anesthesias, nitrous oxide and oxygen. He would limit the use of X-ray for induction of abortion to those nearing the menopause. For induction of labor the employment of castor oil and quinine, followed by an enema and rupture of the membranes has been successful in the proportion of 19 out of 20 cases.

Williams does not believe that DeLee's "prophylactic forceps" should be generally used or recommended. In occipitoposterior presentation, where intervention is required, he uses the Scanzoni maneuver exclusively. The Kielland forceps has no advantage over the Tarnier. He advises against the wide acceptance of Potter's teachings although he gives full credit to Potter as a wonderful technician.

According to the author the various extraperitoneal cesarean sections have come into disfavor and have been replaced by the low cervical cesarean. I cannot refrain from quoting in full the first paragraph dealing with the indications for cesarean section.

"Indications.—With the increasing perfection of surgical technic, and an erroneous idea of the safety of the operation, there seems to be a growing tendency to regard cesarean section as the simplest means of coping with most obstetrical difficulties. At the present time I consider that the operation is being abused, and that not a few patients are sacrificed to the *furor operativus* of obstetricians and general surgeons who are ignorant of the fundamental principles of the obstetric art. This being the case, the conscientious obstetrician should be particularly careful in the recognition of indications for cesarean section."

Cesarean section is particularly unsatisfactory in eclampsia and placenta previa but indicated in premature detachment of the placenta. I cannot agree in any way with Williams who considers the vomiting of pregnancy as due to a constant emission of fragments of villi into the circulation and an increase of folliculin. He considers all vomiting toxic unless other causes are demonstrable. Neurotic vomiting alone is improved by suggestion. For this reason, corpus luteum or other medication has occasionally proved successful. A sharp distinction is drawn between the central necrosis of toxic vomiting and perihepatic hemorrhagic changes in eclampsia.

Williams never induces labor prematurely for contracted pelvis.

In a book of this importance, it is worth while pointing out certain minor inaccuracies which are worth correcting. It was Robert Meyer and not Evans who first described the premenstrual as the "pregravid" reaction. The Aschheim and Zondek test was not first published in 1929 but in 1928 (Klin. Wchnschr. 7: 8, 1928) and therefore antedates Siddall's test. The latter has been entirely superseded in most laboratories by the Aschheim and Zondek test.

It would be better if figures 225 to 230 showed the vulva entirely shaven as this may encourage the casual reader to omit this necessary precaution for full asepsis. To forbid coitus only during the last month of pregnancy seems rather hazardous. The advice of omitting it for the last two months appears sounder to me. Similarly, a full bath, particularly in the case of multiparae at the onset of labor, opens the possibility of entrance of infected bath water into the vagina.

This valuable contribution to obstetrics deserves the continuation of the popularity which it has enjoyed in the past.

—*Robert T. Frank.*

This collection of reprints[5] represents a study of the endocrine glands carried out in the Evans Memorial during the past eighteen years. In it are reviewed a tremendous amount of figures and tables relative to physical, clinical, and laboratory studies on both normal individuals and those suffering from various recognized or obscure disorders of the various glandular systems. Of particular interest to the obstetrician and gynecologist are the study of cases presenting disorders of the male and female gonad, in which the most striking conclusion offered is in regard to pituitary therapy, the necessity for an extraordinary large dosage of anterior lobe material being stressed. Unfortunately no use of the more recent preparations of the ovary is discussed. The lack of a table of contents and of an index renders the collection of small value for reference.

—*Philip F. Williams.*

Granzow[6] has carried out a long series of experimental researches on the relationship of tuberculosis to the normal and reproductive phases of the female generative organs. He discusses the method and results of his studies on guinea pigs which have been infected by intracardiac and intrauterine injections of tuberculosis bacilli in both the pregnant and nonpregnant states. He reviews the effects of produced tuberculosis on abortion, the placenta, organs of the newborn and the puerperal changes of the uterus, and on estrual changes in the nonpregnant animals, and based on these findings considers at length the comparative changes which occur in the human. The monograph is copiously illustrated, with photomicrographs, and there is appended an extensive bibliography germane to the subject.

—*Philip F. Williams.*

Offergeld presents a second edition[7] of his booklet on the hygiene and physiology of the sexual function of women. The booklet could hardly be offered to the laity for their instruction, but might afford information of the type sometimes desired by gynecologists or neurologists to whose attention the results of disorders or disuses of the sexual function are frequently brought.

—*Philip F. Williams.*

Pankow has revised Krönig's[8] small manual for a manikin course in obstetrics. Such a book is of value to a student or physician preparing for a practical examination, in State or National Boards, as the material is presented entirely in the form of questions and answers.

—*Philip F. Williams.*

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[5] **Collected Publications** from the Robert Dawson Evans Memorial for Clinical Research and Preventive Medicine. Boston, 1929.

[6] **Die Wechselbeziehungen zwischen der Tuberkuloseerkrankung and den Generationsvorgaengen im weiblichen Organismus.** Von Dr. Joachim Granzow. S. Karger, Berlin, 1930.

[7] **Der Einfluss des Geschlechtsverkehrs auf das Befinden der Frau,** von Dr. Heinrich Offergeld, Zweite Auflage. Ferdinand Enke, Stuttgart, 1930.

[8] **B. Kroenig's Geburtshilflicher Phantomkurs in Frage und Antwort,** Drittle Auflage. von Dr. O. Pankow. Berlin, Julius Springer, 1930.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

The Pathologic Puerperium

Bryce, Lucy M.: Some Observations on the Bacterial Flora of the Female Genital Passages in Pregnancy and the Puerperium, with Special Reference to Puerperal Infection. Med. J. Australia 2: 102, 1928.

This study was made to find the relationship of the bacterial flora to pregnancy, labor, and puerperium with the possibility of puerperal infection.

The cases were divided into three groups: (1) 50 delivered in or admitted to the Women's Hospital, in whom there was fever following childbirth or abortion, and who were examined postpartum only; (2) 119 were examined while attending antenatal clinics; (3) 30 patients of group 2 were cultured during labor and the puerperium.

In group 1, the streptococci were the most frequent intrauterine inhabitants, being present in 36 per cent of the cases. The gonococci were present in 8 per cent but not one of the cervical cultures revealed the same organism. The Bacillus coli was rather frequent. The staphylococci, diphtheroids, and gram positive bacilli were considered not pathognomonic. The fever in one case in which Bacillus Melchii was found, was for a short period with complete recovery.

There were two fatalities in the group, one from nonhemolytic streptococci and one from which organisms were recovered but none were considered pathogenic.

In group 2, streptococci were found in 24 of 103 cases (23.3 per cent). Eight of these 103 had temperature postpartum above 100.1 for 24 hours or on two occasions, while only two with streptococci antepartum had elevated temperature during the puerperium.

In the third group the writer found the uteri likely to have any or all of the organisms mentioned present, even though only one organism or a few were found in the antepartum examination. Streptococci were present more frequently in the afebrile than in the febrile group.

The writer believes that with fever in the puerperium, a number of organisms, especially from the uterus, are associated usually with a mild type of disease. On the contrary, the isolation of one strain only may or may not be significant. Many of the streptococci are thought to be members of the saprophytic flora in normal puerperal uteri.

The writer further believes that organisms from the air, skin, and feces may so easily be introduced by various means, that one should hesitate to call any type of flora normal or endogenous.

The investigation of the bacteria in the genital tract gives some idea of the personal hygiene and occasionally one may detect some unsuspected disease, as chronic gonorrhea.

Although these figures are too small to be of any statistical value, the author doubts the relationship between organisms found and the clinical course.

H. C. HESSELTINE.

Bar: Coitus Infection as a Cause of Puerperal Fever. München. med. Wchnschr. 31: 1292, 1929.

Bar calls attention to the fact that coitus during pregnancy has been interdicted since the ancient Biblical days. He reports two cases of puerperal sepsis, one of which died. Neither had a vaginal examination before delivery. Careful questioning revealed that both had coitus before the onset of labor. In one case the same organism was demonstrated in the vaginal secretion of the wife and on the prepuce of the husband. The author feels that the obstetrician should emphasize to both husband and wife the importance of sexual abstinence during the latter weeks of pregnancy.

A. SHULMAN.

Ballin: Pregnancy and Sexual Intercourse. München. med. Wchnschr. 31: 1293, 1929.

Ballin feels that it is not necessary to insist upon sexual abstinence for the entire duration of pregnancy. Such instructions are usually disregarded by the patient. If she is a healthy woman, no restrictions are necessary during the first five months of pregnancy. Neither abortion nor other injury is likely to be caused in such a patient. This statement does not apply, of course, to patients with genital abnormalities, such as infantilism, retroflexion, habitual abortion, etc. There is, however, real danger in the practice of coitus during the last months of pregnancy. Hemorrhage, premature rupture of the membranes, intra- and postpartum fever are the most important of these dangers. The author therefore advises marked restriction of coitus from the sixth to the eighth month, and complete abstinence thereafter.

A. SHULMAN.

Miller, Douglas, and Whitaker, J. R.: A Study of the Bactericidal Power of the Blood During Pregnancy and the Puerperium, and its Relationship to the Development and Course of Puerperal Infection. Brit. M. J. 2: 85, 1929.

The method employed in this study consists essentially in mixing whole blood with a known quantity of bacteria on "slide cells," the bactericidal power being gauged by the number of colonies which develop after incubation for twenty-four hours.

Preliminary facts ascertained were:

1. That after blood has been drawn off, it loses at first slowly, then more rapidly its bactericidal property.

2. The bactericidal power of the blood of a healthy individual does not vary from hour to hour or from day to day.

Conclusions reached were as follows:

1. The degree of bactericidal power in patients who subsequently develop sepsis is lower than in those who do not. If the bactericidal power is well above normal for potentially septic patients immediately after labor sepsis may occur, but the patient's chances of recovery are good.

2. The bactericidal power of the blood varies in different individuals, being highest in the pregnant woman.

3. During pregnancy there is a gradual increase in the bactericidal power of the blood, reaching a maximum at or about the time of delivery. Immediately

following delivery there is a rapid decline, so that by the tenth day it reaches the nonpregnant level; thereafter there is a further temporary increase which has disappeared by the twelfth week postpartum.

4. The antibacterial activity of the blood does not materially differ in the nulliparous as compared with the multiparous pregnant or nonpregnant individual. Within normal limits it does, however, seem to be depressed by the albuminuria of pregnancy, prolonged labor, instrumental delivery, and severe blood loss.

5. Leucocytosis increases during pregnancy, reaching its maximum at the time of delivery and thereafter rapidly subsides. While there is a broad parallelism between the variations in the leucocyte count and the antibacterial power of the blood, the relationship is not a constant one, and the latter property may be due to factors other than, or in addition to, a mere increase in white cells. No relationship exists between the degree of bactericidal power, the number of red blood cells, the percentage of hemoglobin, or the color index.

GEORGE E. HUDSON.

Teoumine, S.: The Blood Platelets in the Prognosis of Puerperal Sepsis. Gynéc. et Obst. **15:** 436, 1927.

The author examined 56 patients, most of whom were seriously ill and 11 of whom died of puerperal sepsis. In all, 243 counts were made. The author concludes that the number of platelets undergoes regular, definite fluctuations in the course of septic puerperal infection, which probably reflect the relation between the mechanisms of defense and aggression. Increased quantity of platelets indicates increased defenses on the part of the organism. In the cases with a favorable outcome the number of platelets attained was the largest, but varied greatly, 47,000-604,000. Toward the end, the figure returns approximately to normal limits. In the fatal cases the platelet count is ordinarily low at the beginning, diminishing still more toward the end. The normal variation of the blood platelets is from 300,000 to 400,000 per c.mm. Every increase in the platelet count should be considered favorable, every diminution an unfavorable sign, a fatal prognosis being justified only if the drop is to below normal and persistently so. Such a drop, however, may not be present in very serious cases. This may be explained by the rapid depletion of the defenses of the organism without apparent reaction. There seems to be no constant parallelism between the platelet count and the white and red blood count.

GOODRICH C. SCHAUFFLER.

Laffont and Fulconis: The Prognostic and Specific Value of the Intradermal Reaction to the Streptococcic Filtrate in Puerperal Infection. Bull. Soc. d'obst. et de Gynéc. **6:** 420, 1929.

Many intradermal injections of a streptococcus filtered culture were given but no bad reactions were observed. It was found that all the women who showed a positive reaction even during the course of a streptococcus puerperal infection failed to develop septicemia. All those who did not react to the injection developed severe complications which persisted a long time, or died of infection due to streptococcus or other organisms. The authors conclude that the intradermal reaction of streptococcus filtrate possesses a definite prognostic value in cases of puerperal infection. It varies with the patient and during pregnancy. Its intensity diminishes particularly during the last few days of pregnancy and during labor. It is not specific because the filtrates of cultures of different organisms provoke the same result. Infections not due to streptococci modify the reaction.

J. P. GREENHILL.

White, H. Burt: Puerperal Sepsis and Sensitiveness to Streptococcal Toxins. Brit. M. J. No. 3518, p. 974, 1928.

This investigation was initiated to test the reaction of pregnant women to the scarlatinal toxin. This experiment did not altogether make clear the correlation of toxin-sensitiveness with a past history of scarlet fever or streptococcal infections.

Of 100 pregnant women, 27 were sensitive to a dose of 1/5 c.c. of a dilution of 1 in 1,000 scarlatinal toxin injected intradermally. Eight of the "toxin-sensitive" women experienced morbid puerperia. From the cervices of those examined a pure growth of streptococcus pyogenes was obtained. Labor was altogether normal in 6 of these cases, and normal in the remaining 2, except for slight postpartum hemorrhage.

Of 100 pregnant women, 73 gave no reaction to scarlatinal toxin; two of these exhibited morbid puerperia (British Medical Association standard), but in neither case could streptococci be found in the cervix or blood.

Thirteen of the nonreacting women, or 19 per cent, sustained difficult labors but healthy puerperia; 6 of these were examined bacteriologically, but in no case was Streptococcus pyogenes found.

Operative interference increased the rate of sepsis almost ten times.

Summarizing the situation following this investigation of over 2,000 cases, the author comes to the conclusion that vaccines are of secondary importance in the prevention of sepsis as compared with the conservative and aseptic treatment.

ADAIR-JOHNSON.

Stent, Lois: The Dick Test in Relation to Incidence of Puerperal Infection. Lancet 1: 1066, 1930.

The Dick Test was used on 500 women; 248 in the last week of pregnancy, 152 during labor, and 100 within twenty-four hours after delivery. In all there occurred 9 severe postpartum infections, 5 of which had been Dick negative and from the blood stream of 4 of these the Streptococcus hemolyticus was isolated. Two deaths occurred in this last group. Although this organism was the only one recovered from the blood, there were mixed infections locally, two with Bacillus Welchii. The hemolytic streptococcus was found in the uteri of 6 other Dick negative patients.

Both anaerobic and aerobic cultures were used throughout this study, but the streptococci were not so classified.

The failure of the streptococcal toxin to measure the immunity of these patients may be explained by: the associated trauma of parturition, mixed infections locally, very invasive strains, or unidentical hemolytic streptococcal strains. Consequently the writer repudiates the use of this test for determining susceptibility to streptococcal puerperal infection.

H. C. HESSELTINE.

Salmond, Margaret, and Turner, Beatrice: The Dick Test in Pregnancy. Brit. M. J. 2: 145, 1929.

Results were as follows: Of 533 women who received the Dick test 70 per cent were negative. Of 158 Dick positive reactors 15 per cent became febrile.

As the Dick reaction is only a test of streptococcal antitoxin in the blood, and as fever in these cases was due to numerous causes no attempt being made to determine if it were due to streptococcus or not, it is difficult to see wherein the experiment is of much practical value.

GEORGE E. HUDSON.

Bublichenko: Bezredka's Antivirus in Prognosis and Prophylaxis of Puerperal Sepsis. Russk. Klin. **11:** 547, 1929.

In this study the author employed, by means of intradermal injections, Bezredka's antivirus, a filtrate of old broth cultures of many different strains of streptococci and staphylococci.

A marked redness within from four to twenty-four hours and local tenderness for several days represent a positive reaction.

Among 154 patients suffering from puerperal sepsis the writer found the reaction strongly positive in 113, moderately positive in 23, slight or negative in 18. No patient of the first two groups died. Of the remaining 18 with slight or negative reaction 5 died of sepsis and 13 recovered. Patients with a history of scarlet fever showed a positive reaction in 95 per cent.

Naturally the thought suggests itself of using this antivirus as prophylactic measure. The author employed it also locally in form of vaginal tampons and observed rapid healing of puerperal ulcers and quick resorption of exudates.

His conclusions are: A negative reaction is prognostically unfavorable, while a positive reaction permits a favorable prognosis. Intradermal injections of the antivirus in doses of 0.2 c.c. increase the patient's resistance against puerperal infection.

ALEXANDER GABRIELIANZ.

Delmas and Brémond: The Preventive Treatment of Puerperal Infection with Sulpharsenol. Bull. Soc. d'obst. et de Gynéc. **17:** 433, 1928.

The idea of treating puerperal infection with sulpharsenol originated with Rivière. Since November, 1927, in the Montpelier Maternity sulpharsenol has been given to every patient during whose labor the asepsis was questionable. During three months 67 patients were given this drug. In only 33 of these cases was the puerperium afebrile and in five cases the fever was due to extragenital causes. There was no mortality in the remaining 29 patients who had fever and the majority of these patients were not very ill. The authors believe that sulpharsenol did not reduce the morbidity of puerperal infection but its prophylactic value rested in the benignity of the infection which resulted in most of the cases.

J. P. GREENHILL.

Le Lorier: A Few Successful Results With Intravenous Injections of Novarsenobenzol in Puerperal Sepsis. Bull. Soc. d'obst. et de Gynéc. **18:** 453, 1929.

The author is firmly convinced that the intravenous injection of novarsenobenzol in cases of puerperal septicemia is very helpful and he reports seven cases to prove his contention.

J. P. GREENHILL.

Pfalz, G. J.: The Influence of Specific and Nonspecific Protein Bodies on the Bactericidal Power of the Blood in Staphylococcic and Gonorrheal Infections of the Female Generative Organs. Arch. f. Gynäk. **134:** 73, 1928.

The author used the method devised by Wright for testing the bactericidal powers of the blood in three cases of hematogenous postabortal sepsis, in three cases of exudative posterior parametritis, and in two cases of breast abscess. There were no changes in the bactericidal index in the five cases of localized purulent staphylococcus infections but in the three cases of generalized infection, the bactericidal index followed exactly the temperature and clinical course. Pfalz believes that the determination of the bactericidal index has definite prognostic

value. Following nonspecific, specific, or combined protein injections there is a definite rise in the bactericidal power of the blood. This rise is always definite and occurs as follows: First there is a negative phase lasting less than one hour. This is followed by an active labile phase for a number of hours following each injection; third, there is a continuous and steady rise in resistance from the inauguration of the treatment until the optimal dose is given. The author also believes that the specific antigens produce a nonspecific bactericidal process which does not correspond to the formation of specific antibodies.

RALPH A. REIS.

Anderodias: The Modern Treatment of Puerperal Infections. J. de méd. de Bordeaux **59**: 95, 1929.

Anderodias attacks the patient from three standpoints, first, those cases where infection is suspected but has not yet developed; second, where the infection is present and still localized; and finally, where the infection has spread beyond the confines of the pelvis and a general septicemia has developed.

From a prophylactic standpoint, besides close observance of aseptic technic, he advocates subcutaneous injections of sulpharsenol. In a series of 1166 deliveries where this was used the maternal mortality was zero.

Treatment of evident puerperal infection: (a) *Serotherapy.* This form of treatment is deficient because of the polymorphism of the streptococcus. (b) *Vaccinotherapy.* The results from this form of treatment when given subcutaneously have not been brilliant. Where local immunization by direct application of the vaccine to the infected area has been attempted the results have been more satisfactory. (c) *Immuno-transfusion.* The blood of a person who has become immunized against the streptococcus is transfused into the patient. The results have not been striking. (d) *Chemotherapy.* Such chemical compounds as acroflavine or mercurochrome 220 are injected into the blood stream. Among them sulpharsenol is the best and should be administered in doses of 12 to 18 centigrams.

(e) *Surgical Treatment.* The operations which have been advocated are hysterectomy, venous ligation or resection, and laparotomy with extensive abdominal drainage. Could one be sure that the infection were limited to the uterus, hysterectomy would undoubtedly give excellent results. However, in the majority of cases, the infection spreads rapidly to the parametrial tissues. Hysterectomy, therefore, should be reserved for very special cases such as multiple uterine abscesses, complicating fibroid tumors, and secondary uncontrollable uterine hemorrhages. The mortality in puerperal thrombophlebitis treated surgically is about 54 per cent as compared with a 25 per cent mortality under medical treatment. In general peritonitis, laparotomy and extensive abdominal drainage have yielded slightly better results than medical treatment.

In reviewing the various forms of treatment Anderodias concludes that all douches should be avoided. In the localized conditions gauze soaked in horse serum or antistreptococcus bouillon should be applied locally each day. In the case of endometritis, where the condition is not due to a lochiometra, gauze soaked in horse serum should be packed into the uterus daily. In lochiometra it will prove sufficient to establish drainage. In cases of generalized septicemia the local treatment should be continued and everything done to maintain the general resistance of the patient at the highest possible point and, in addition, "abscess of fixation" induced by injecting 2 c.c. of essence of turpentine into the antero-external region of the thigh. If no reaction occurs within forty-eight hours a second injection is made one centimeter from the first. The injections of sulpharsenol up to 18 centigram doses should be continued.

THEODORE W. ADAMS.

Item

American Board of Obstetrics and Gynecology

The following names have been added to the list of Certificate holders published in the February issue.

Barnard, Everitt	Philadelphia, Pa.
Beck, A. C.	Brooklyn, N. Y.
Brettauer, Joseph	New York City
Brodhead, G. L.	New York City
Cornell, E. L.	Chicago, Ill.
Dickinson, R. L.	New York City
Furniss, H. Dawson	New York City
Heaney, N. S.	Chicago, Ill.
Kerwin, William	St. Louis, Mo.
Kostmayer, H. W.	New Orleans, La.
Meaker, S. R.	Boston, Mass.
Morse, Arthur H.	New Haven, Conn.
Nicholson, William R.	Philadelphia, Pa.
Paine, A. K.	Boston, Mass.
Piper, E. B.	Philadelphia, Pa.
Potter, Irving W.	Buffalo, N. Y.
Scott, W. A.	Toronto, Canada

For further information apply to the Secretary, Dr. Paul Titus, 1015 Highland Bldg., Pittsburgh, Pa.